TECHNOLOGY DEPARTMENT

ROADS AND STREETS

HIGHWAY BRIDGES
AIRFIELDS
NAVY CONSTRUCTION

DECEMBER 1948

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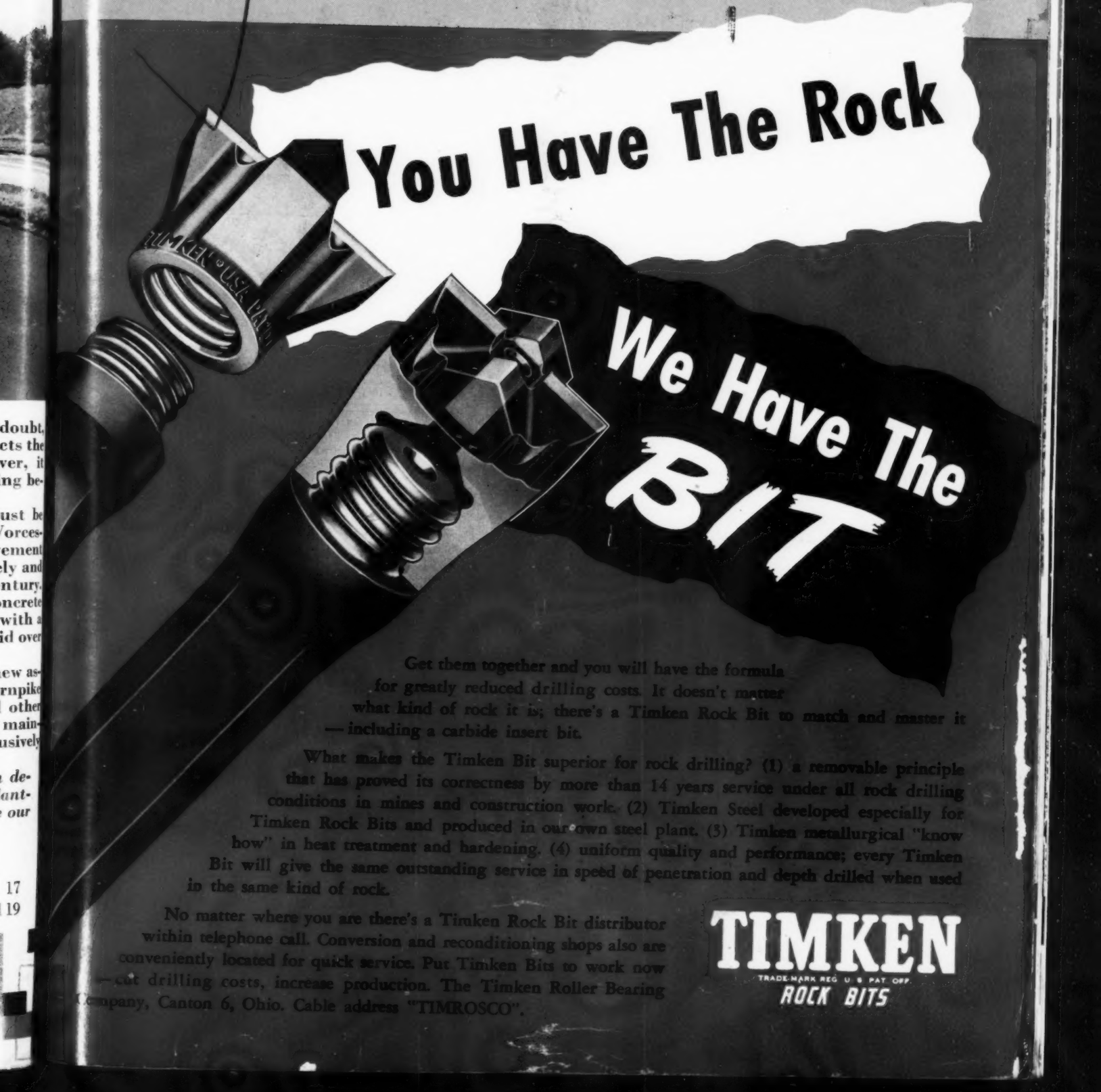
DETROIT



Get them together and you will have the formula for greatly reduced drilling costs. It doesn't matter what kind of rock it is; there's a Timken Rock Bit to match and master it — including a carbide insert bit.

What makes the Timken Bit superior for rock drilling? (1) a removable principle that has proved its correctness by more than 14 years service under all rock drilling conditions in mines and construction work. (2) Timken Steel developed especially for Timken Rock Bits and produced in our own steel plant. (3) Timken metallurgical "know how" in heat treatment and hardening. (4) uniform quality and performance; every Timken Bit will give the same outstanding service in speed of penetration and depth drilled when used in the same kind of rock.

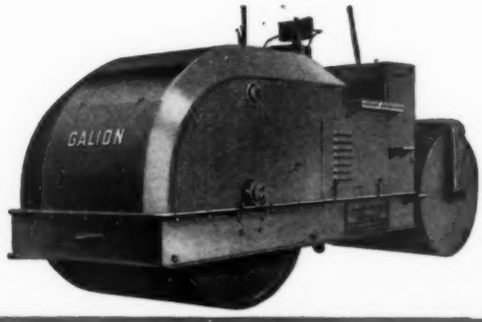
No matter where you are there's a Timken Rock Bit distributor within telephone call. Conversion and reconditioning shops also are conveniently located for quick service. Put Timken Bits to work now — cut drilling costs, increase production. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address "TIMROSCO".

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
ROCK BITS

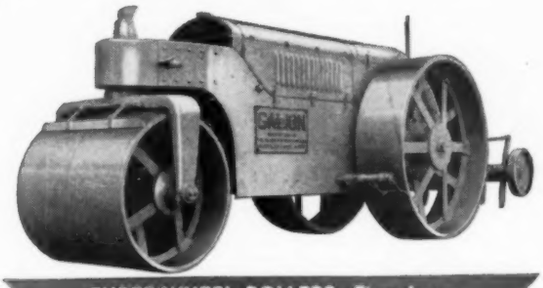
GALION

-an Old Name that Stands for the Newest and Best in

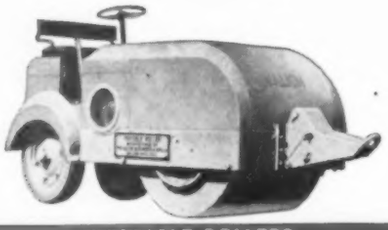
ROLLERS and GRADERS



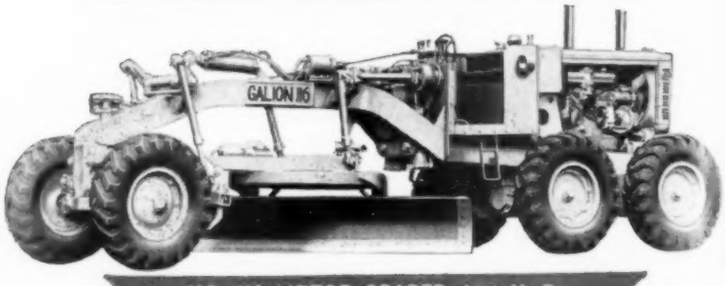
TANDEM ROLLERS, Four Sizes—
variable in weight from 3 to 14 tons.



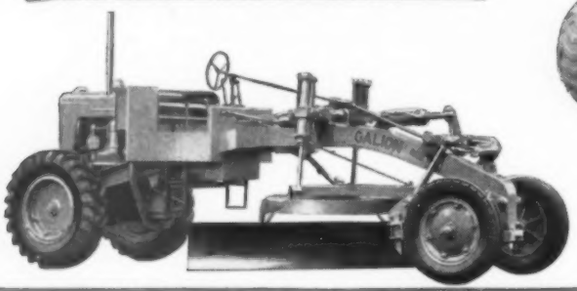
THREE-WHEEL ROLLERS, Five sizes—
6, 7, 8, 10 and 12 tons.



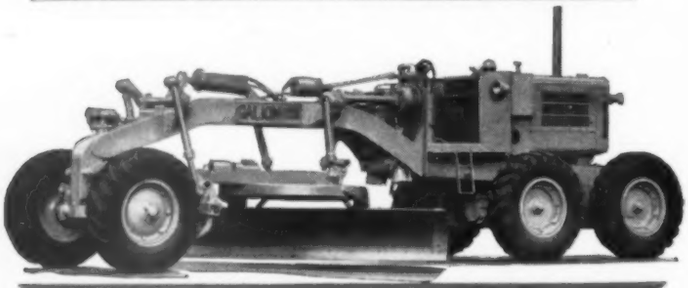
PORTABLE ROLLERS
for Patching and Odd Jobs.



NO. 116 MOTOR GRADER, 100 H. P.
for Extra Heavy-Duty Service.



NO. 402 MOTOR GRADER, 31 H. P.
for economical Maintenance Work.



NO. 103 MOTOR GRADER, 76 H. P.
for Heavy-Duty Service

In the heavy construction field -- among contractors, engineers, and users who know equipment best -- GALION Graders and Rollers have long been regarded as being tops in performance, dependability, and profitable service.

Write for literature on the type of equipment in which you are interested -- and the name of nearest Distributor.

THE GALION IRON WORKS & MFG. CO.
General and Export Offices
Galion, Ohio, U. S. A.
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GALION Estab. 1907

GRADERS · ROLLERS

Eliminating Bad Curve On New York's Route 26

Above: Heavy grader makes short work of stones and dirt as it smooths the way for bridge approach.

Right: To provide firm foundation, Bethlehem H-Piles are driven to solid rock. Over 100 tons of H-Piling were used in building the two bridges.

Below: Crane swings load of Bethlehem Reinforcing Steel onto partly-built bridge.

Construction detail is discussed by Robert Baker (left), general foreman, and Edmund P. Smith, superintendent, both of Binghamton Construction Co.

The construction scenes shown here were taken recently at Glen Aubrey, N. Y., during a curve-elimination project on Route 26, popular north-south highway originating southwest of Binghamton, at the boundary with Pennsylvania. The project was handled by the Binghamton Construction Co., Binghamton, N. Y., and included the erection of two 50-ft-span bridges. Reinforcing Bars and H-Piles were furnished by Bethlehem.

Spreading blanket of concrete over Bethlehem Reinforcing Bars in bridge deck.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
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STEEL FOR HIGHWAYS

Dowel Units • Reinforcing Bars • Bar Mats • Guard Rail
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Hollow Drill Steel • Spikes • Bolts and Nuts
Timber Bridge Hardware • Tie-Rods
Sheet and H-Piling • Fabricated Structural Steel

BETHLEHEM STEEL

ROADS AND STREETS

December, 1948 • Vol. 91 • No. 12

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting

Coming Articles

Contractor Performance

Shortages or no shortages, many contractors seem to have "gone to town" in grading, paving and aggregate production. Watch for case articles.

County

How one county stepped up gravel production and road stabilization on its county and township roads.

City Streets

Halsted Street in Chicago, one of several "what, where, how and why" stories on street work in the offing.

Airports

Details on the big concrete arch hangar up at Limestone.

Bridges

Another "economy" design for secondary roads; how an open-spandrel concrete arch was built in Indiana; a picture parade of interesting bridges completed in 1948.

Job and Equipment Ideas

This popular department will "come alive" with money-saving kinks and suggestions.

Meetings

The Highway Research Board, a reporter's "headache" with its 70 or so technical papers—look for a meaty report in January. Ditto for other national meetings of the winter in later issue.

Paving and Surfacing

Several project articles and technical reports soon, including new Texas data on lime stabilization.

Maintenance

Latest equipment for cleaning concrete road joints (Calif.) . . . handling creosoted posts mechanically.

And—

The Outer Banks road in N. Carolina . . . cement treated base black-top job in California . . . Modernization plans for the Brooklyn Bridge . . . Progress on the Tacoma Narrows bridge . . . Continuing expressway series.

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

Gillette Publishing Company
Publication and Editorial Offices,
22 West Maple Street, Chicago 10, Ill.

HAROLD J. McKEEVER, Editor

C. T. MURRAY, Managing Editor

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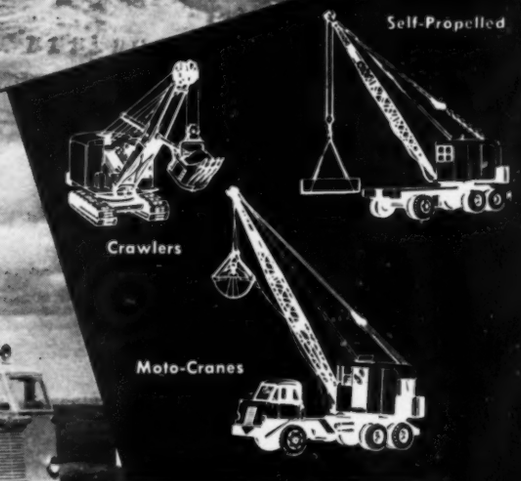
Operation "Action"...
with LORAIN-41 SERIES on the job!

If you're looking for a "powerhouse" of action on construction jobs, then inspect the complete line of the Lorain-41 Series. For these machines are built to "take it" and come back for more . . . All the turntable stress-producing elements—Machinery Frame, Operating Shafts, Struts, Front Rollers, Boom Connections, etc.—are mounted on a double annealed, alloy steel, one-piece Bed Casting with the strength of a battleship.

And you have your choice of mountings . . . 2-speed crawler or three types of rubber-tire carriers, and all models are available with interchangeable boom equipment for shovel, crane, clamshell, dragline and hoe operation. Check with your Thew-Lorain distributor—today—for more money-making facts on this and other versatile machines in the complete Lorain line.

THE THEW SHOVEL COMPANY • Lorain, Ohio



Thew **Lorain**® **41** SERIES

Blackhawk Low-Cost, High-Pressure Hydraulic Controls Give You

EXTRA DEPENDABILITY PERFORMANCE EASE OF HANDLING

RAMS

Compact Blackhawk Hydraulic Rams are designed for high-pressures up to 10,000 lbs. per square inch. Available in a wide range of standard sizes, there is a Blackhawk Ram to fit every need. Their extra power means faster, smoother, more dependable operation.

PUMPS

Blackhawk makes both power-driven and hand-operated hydraulic pumps. Pumps range in capacity from 2500 to 5000 p.s.i. Because of the high pressures developed, these pumps not only are compact in themselves, but permit smaller oil lines, smaller diameter rams and compact valves. This means less friction — greater efficiency — easier servicing.

VALVES

Compact Blackhawk Control Valves permit fingertip control of rams at all times. Valve can be mounted separate from the pump in any position convenient for the operator. This creates ease of handling. Energy is not dissipated in needless friction losses as with tiring mechanical devices.

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TO EQUIPMENT MANUFACTURERS: Blackhawk Hydraulic Controls (Pumps, Rams, and Valves) are engineered and priced for quantity purchases and installation on your products. Submit your hydraulic problems to us. We will work with you in confidence.

Write for this new bulletin. It is a practical working guide for the selection of either hand-operated or power-driven hydraulic units.

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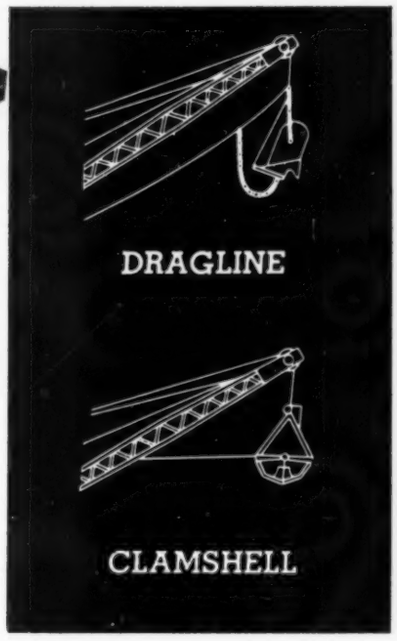
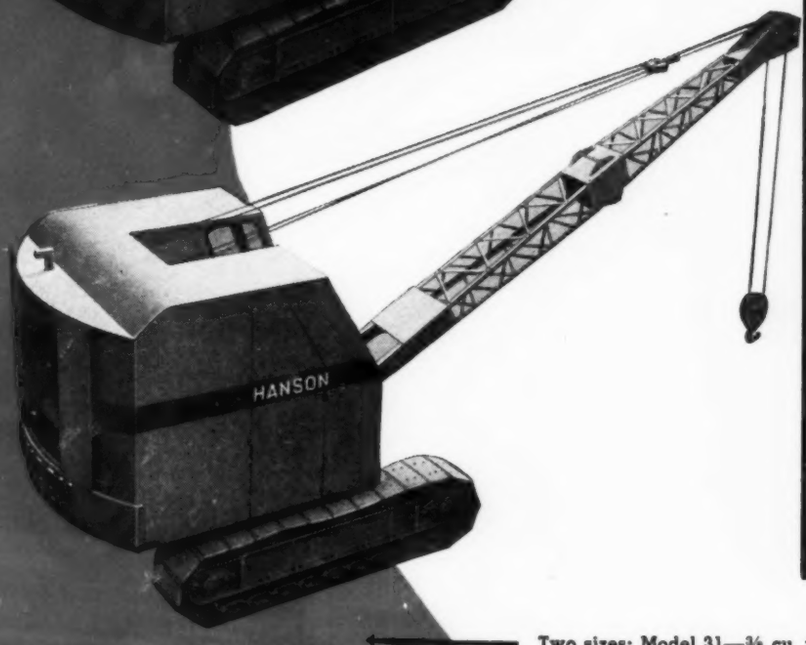
HAND JACKS • SERVICE JACKS • WRENCHES • PORTO POWER • RECK-RACK

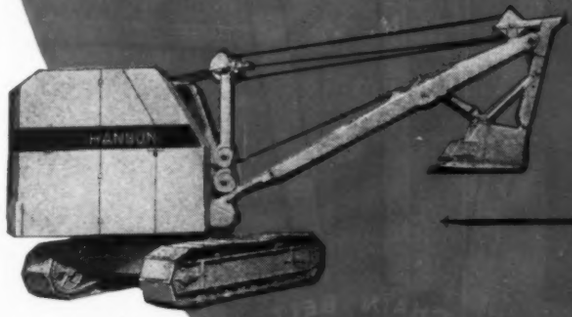
YOU GET MORE WORK DONE..with a HANSON

Check that statement against the record. Ask any operator who uses one of the new Hansons. Repeat orders from present users and unsolicited comments from the men who pull the levers—on the job—justify this claim.





Two sizes: Model 31—¾ cu. yd. as shovel or 4½ tons as crane.
Model 41—½ cu. yd. as shovel or 6½ tons as crane.
Basic unit easily and quickly converted in the field to shovel, trench-hoe, crane, clamshell or drag-line.

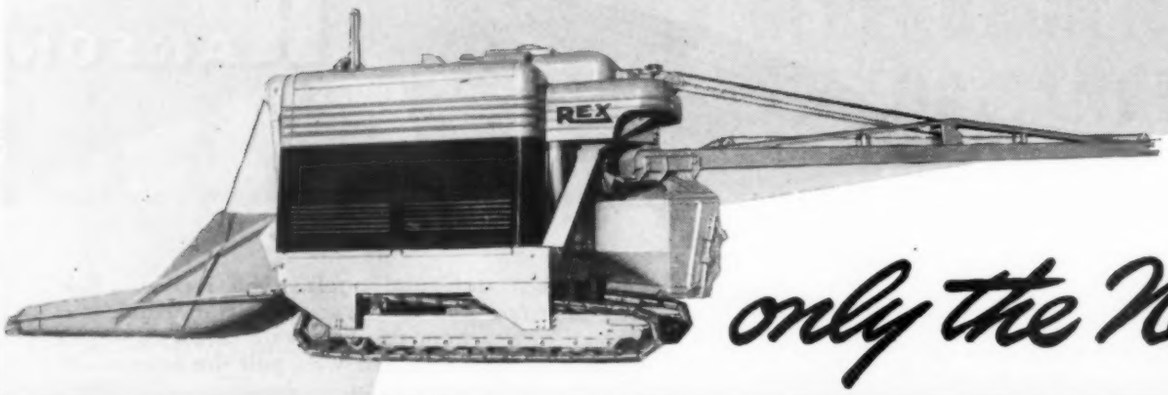


FEATURES: Full revolving . . . chain crowd . . . fully enclosed steel cab . . . welded steel construction . . . ball or roller bearings at all vital points . . . air controlled steering . . . disc type clutches on swing . . . internal expansion, booster type clutches on hoist and crowd . . . all clutches easily and quickly relined without removing shaft assemblies . . . extra long crawlers . . . heavy duty industrial type motor . . . gasoline or diesel.

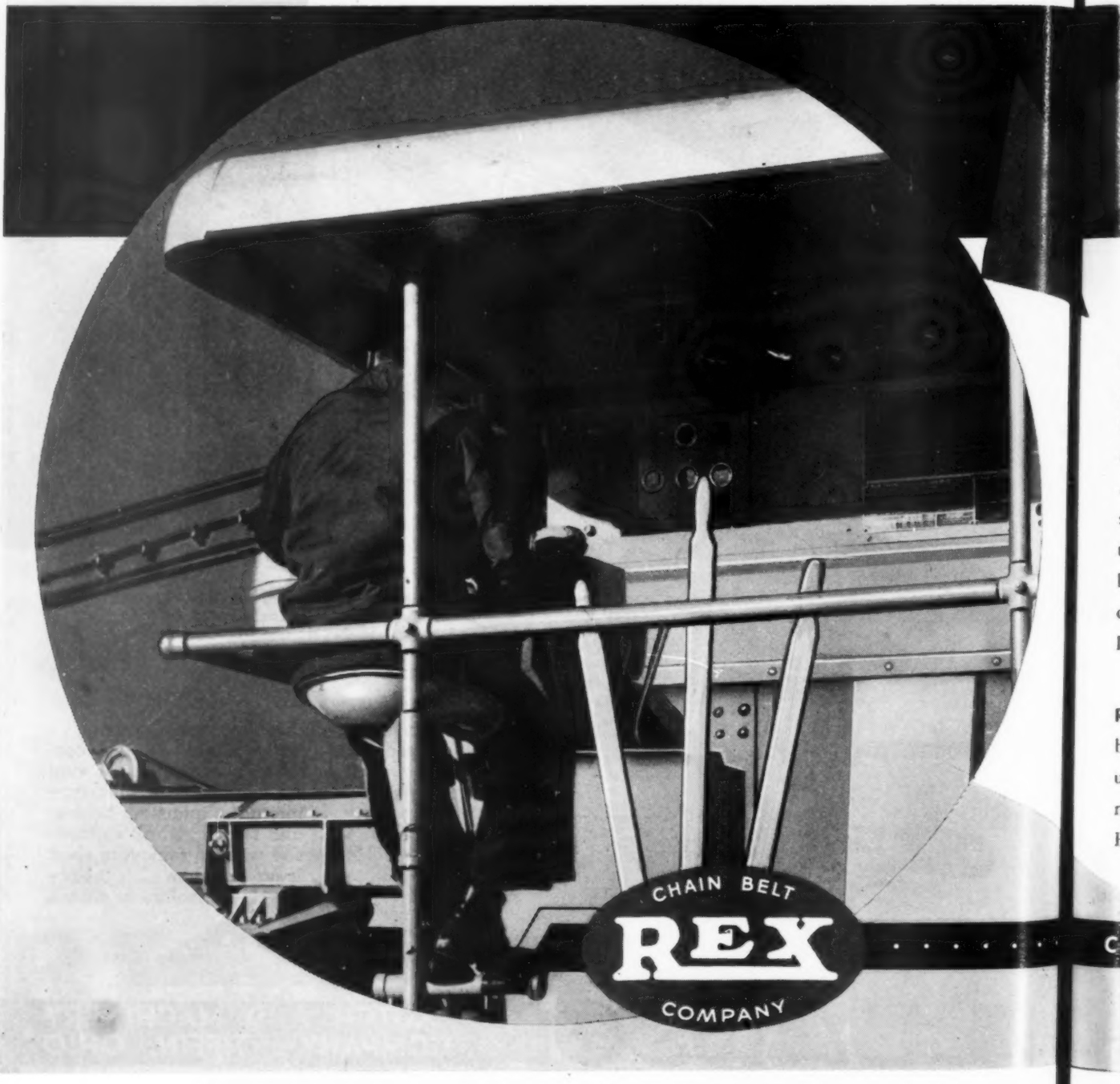
Write for detailed specifications, catalog RS-248

HANSON CLUTCH AND MACHINERY COMPANY TIFFIN, OHIO

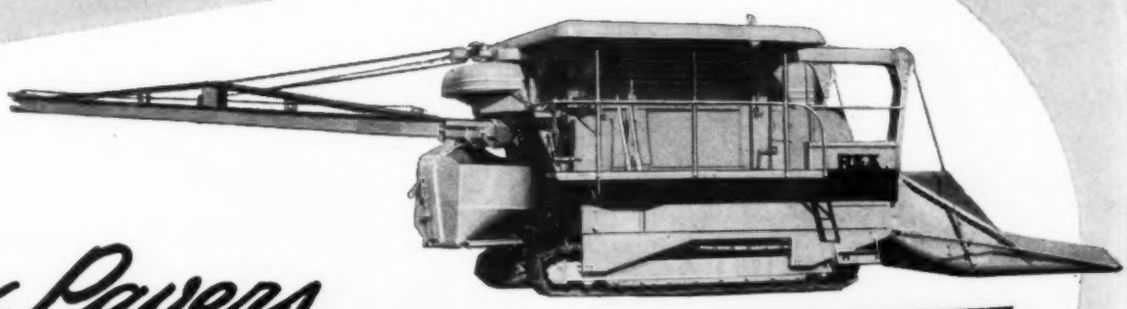
REX 34E SINGLE DRUM PAVER . . . ENGINE SIDE



only the New



REX 34E DOUBLE DRUM PAVER . . . OPERATOR'S SIDE



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REX HYDROCYCLE CONTROL is a profit advantage you can't afford to miss. It gives you a faster over-all batch cycle for most yardage placed on the sub-grade. It cuts down operator fatigue . . . enables him to keep the paver going at top speed all day long. It's foolproof . . . eliminates the human element. It assures exact timing of batch cycle and mixing time . . . eliminates those costly wasted seconds that add up to so much lost yardage and lost profit.

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REX HYDROCYCLE CONTROL eliminates many drives, gear cases, rods, levers, bell cranks, etc. All control units can be placed right in front of the operator. The whole paver is more accessible for easiest maintenance.

WHY NOT have your Rex Distributor show you how Hydrocycle and the many other new advantages of the new Rex Pavers add up to greater yardage production . . . most profit for you. Or if you prefer, write us direct. Chain Belt Company, 1685 West Bruce Street, Milwaukee 4, Wis.

CONSTRUCTION MACHINERY

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*T/M REG. U. S. PAT. OFF.

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2 Pipe Across Trench Is No Problem

Trenchliner digs up to pipe, then over, then slides boom under pipe. Hand work is virtually eliminated.

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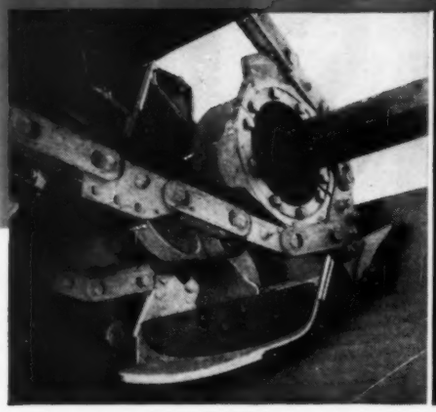
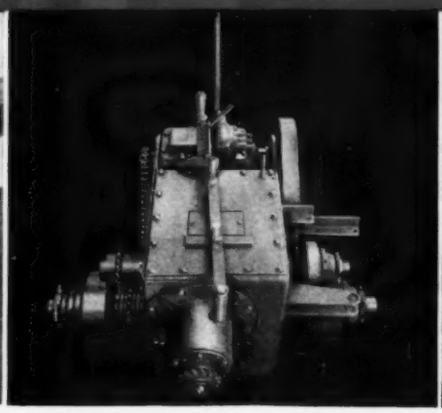
Trenchliner ditches are uniform, the width you need at the depth you want, straight-walled, round-bottomed, ready for pipe with minimum hand work.

PARSONS COMPANY
Newton, Iowa • Koehring Subsidiary

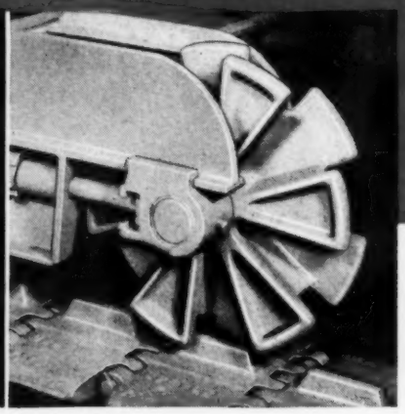
Eliminates Costly Maintenance Hand Work



SELF-CLEANING BUCKETS—No hand work. Buckets are scraped out automatically by spring-cushioned cleaner. Each bucket gets a big bite . . . all pay dirt . . . because bucket is always clean.



OIL CHANGED ONLY TWICE A YEAR — Even under continuous operation. All gears activating operations of Parsons Trenchliners enclosed in one oil-tight case, in continuous oil bath.



PROTECTED AGAINST ABRASIVE WEAR — Entire crawler assembly is self-cleaning. Main machinery is well shielded from bucket line spill . . . stays clean . . . moving parts throughout are protected.

Full Batch Discharged in 7 Seconds

Kwik-Mix Dandie Concrete Mixers

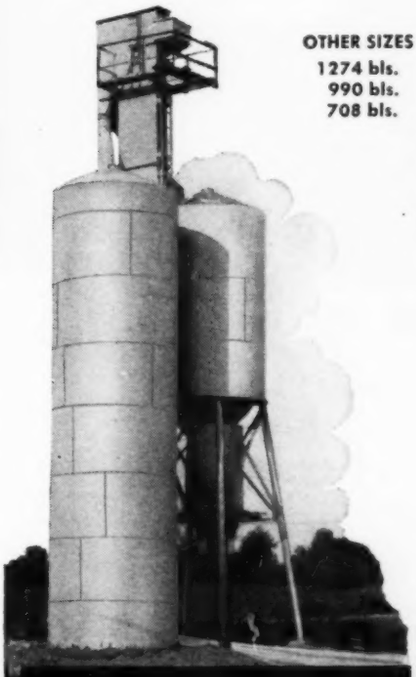
Tilted Flow-Line Discharge Chute, exclusive on the Kwik-Mix Dandie line of concrete mixers, reaches deeper into the drum, intercepts tumbling concrete at just the right angle to maintain natural flow-line in discharge. Kwik-Mix Dandie mixers are available in the following sizes: 3½-S, 6-S, 11-S, 16-S.

KWIK-MIX COMPANY
PORT WASHINGTON, WISCONSIN

Top Capacity plus Full Portability

Johnson Twin-Silo Bulk Cement Plant

Johnson Twin Silo bulk cement plant, stores as much as 1550 barrels of cement, yet is fully portable. Welded construction speeds erection.



OTHER SIZES
1274 bls.
990 bls.
708 bls.

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CHAMPAIGN, ILLINOIS

Enclosed Gears Run in Continuous Oil Bath

Koehring 304 Heavy-Duty Pullshovel

Heavy-Duty leader in the ¾ yard class. An excellent tool for the trenching jobs where wide sloped trenches are required or where nature of material to be excavated calls for shovel digging. Maintenance time cut in half, because all gears are enclosed, run in continuous oil bath. Anti-friction bearings require lubrication only twice a year.

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MILWAUKEE 10, WISCONSIN

ONTARIO. A "Caterpillar" Diesel D7 Tractor, equipped with hydraulic snow plow and wings, opening a Grey County road for traffic. County owns several other "Caterpillar" units.

JUST A

FOR "C

MINNESOTA. A "Caterpillar" Diesel No. 12 Motor Grader, equipped with snow plow and wing, opening a Norman County highway packed with rock-hard snow three to ten feet deep.

CATERPILLAR D

REG. U. S. PAT. OFF.

A PUSHOVER
R "CATERPILLAR" DIESELS

BEHIND a snow plow "Caterpillar" Diesel Tractors and Motor Graders take tough jobs in their stride. Last winter's record-breaking falls and drifts were an especially tough challenge. But the machines went through! Engine mounted directly over the drive wheels in the Motor Graders and all weight saddled over broad, deep-grousered tracks in the Tractors, give these snow-fighters huge capacity and lugging ability.

It is the sort of equipment which throughout the heavy-winter belt is wiping out the dread of rural and municipal isolation due to snowbound roads. It is keeping marketways open, mail, school bus and doctors' routes clear, ranches accessible, factories in operation. What county or city today can afford not to look toward the winters' needs for keeping its people and businesses going about their daily work?

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

SOME USER COMMENTS

- "This 'Caterpillar' No. 12 is a fine machine—great for the different jobs it can do. In summer we use it for ditching, back-filling and general road maintenance. In winter we've cleared up to 60 miles of road a night (11 hours). We like its speed—the way it can get up and go on the snowy roads."—*Clarence Gibbons, Operator, New Liskeard, Ont., Department of Highways.*

- "Here in Kittson County, Minn., we are right in the center of the blizzard bowl. The storms come roaring in over thousands of square miles of open prairie country. It is then when we appreciate our big 'Caterpillar' No. 12 Motor Graders with their added power and dependability. We are 100% sold on 'Caterpillar.' "—*J. S. Schmit, County Engineer's Office.*

- "The new 'Caterpillar' Diesel No. 12 is about the best motor grader job on the market. Its added power makes a big difference. You'd be surprised where we can operate it. A narrow road in the forest is an example—just wide enough to pass the machine, yet we never bark a tree."—*H. Pearson, Operator for Beltrami Co., Minn., Highway Engineers.*

- "We are well satisfied with the new 'Caterpillar' No. 12 Motor Grader. We plow and wing out around 100 miles of roads per 8-hour day—although we believe we could do considerably more."—*M. Nygard, Highway Engineer, Polk County, Minn.*

- "'Caterpillar' Diesel Tractors certainly do the snow-removal job! I think they work on less fuel than any other tractor we've had. What we also like is that the engine wears longer."—*Allan C. Cook, Cook Construction Co., Barrie, Ont.*

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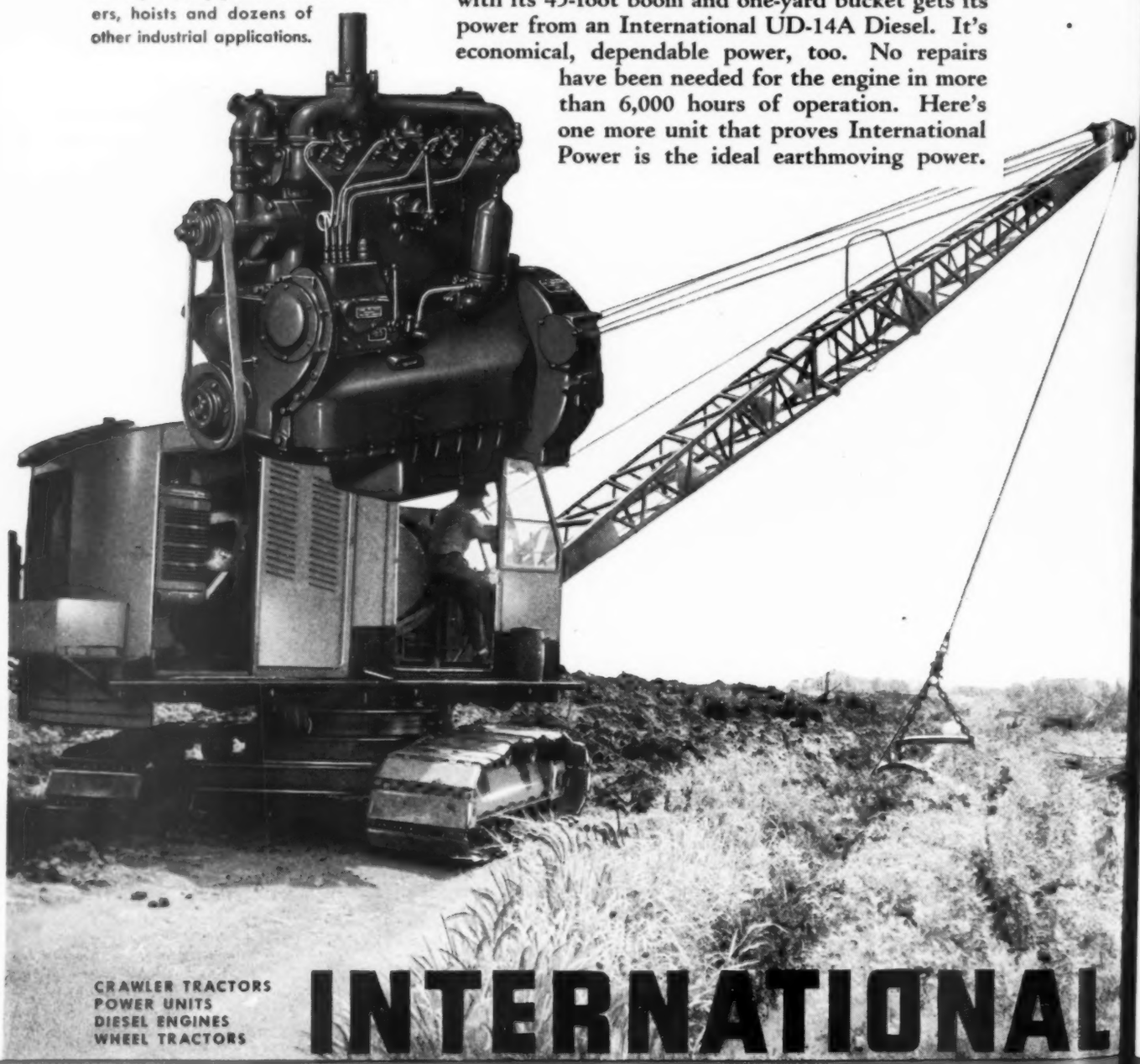
EARTHMOVING EQUIPMENT

EARTHMOVING POWER— *by* INTERNATIONAL

The International UD-14A Diesel delivers 76 working horsepower. You'll find it powering generators, rock crushers, hoists and dozens of other industrial applications.

Averaging 70 yards of earth an hour, this dragline with its 45-foot boom and one-yard bucket gets its power from an International UD-14A Diesel. It's economical, dependable power, too. No repairs have been needed for the engine in more than 6,000 hours of operation. Here's one more unit that proves International Power is the ideal earthmoving power.



CRAWLER TRACTORS
POWER UNITS
DIESEL ENGINES
WHEEL TRACTORS

INTERNATIONAL

The International UD-9 Diesel engine produces 53 working horsepower. You'll find UD-9 Diesels in cranes, compressors and many other types of construction and industrial equipment. International engines are the mark of quality in powered equipment.

A payloader, with one-yard bucket, driven by an International UD-9 Power Unit, does dozens of jobs in its daily diet of work. This versatile tool is built to handle earth, loose materials, rock and similar commodities either in industrial set-ups or on contractors' spreads.

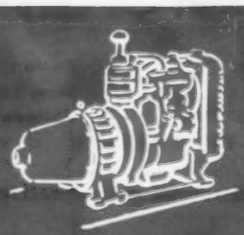
Listen to "Harvest of Stars" featuring James Melton every Wednesday evening—CBS.

Whatever your earthmoving power requirement may be, insist on equipment powered by International engines. They are your guarantee of durable, cost-cutting horsepower. See your International Industrial Power Distributor about International-powered earthmoving equipment. You'll find International engines pay big dividends in freedom from down time, and in work done. It's wise to remember—wherever you need an engine—you need an International.

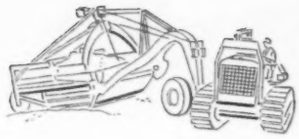
INTERNATIONAL HARVESTER COMPANY, CHICAGO

INTERNATIONAL HARVESTER

Industrial Power



"Greater yardage lower maintenance costs



with Gulf Quality Lubricants and Fuels"

...says Florida Contractor

B. B. McCormick & Sons, Inc., Jacksonville Beach, Florida, have the contract to build about six miles of State Highway #125 in Baker County, Florida. The project involves clearing and grubbing, grading 70,000 yards, approximately the same yardage of lime rock base, surface treatment, and a 200-foot concrete bridge.

"Our earth moving equipment is delivering top-notch performance with Gulf lubricants and fuels on the job—one big reason we're making fast time," says Joseph Dickey, Superintendent of B. B. McCormick & Sons, Inc. "Gulf products and fine service help us get more work out of each unit and avoid mechanical troubles, which means extra yardage and lower maintenance costs."

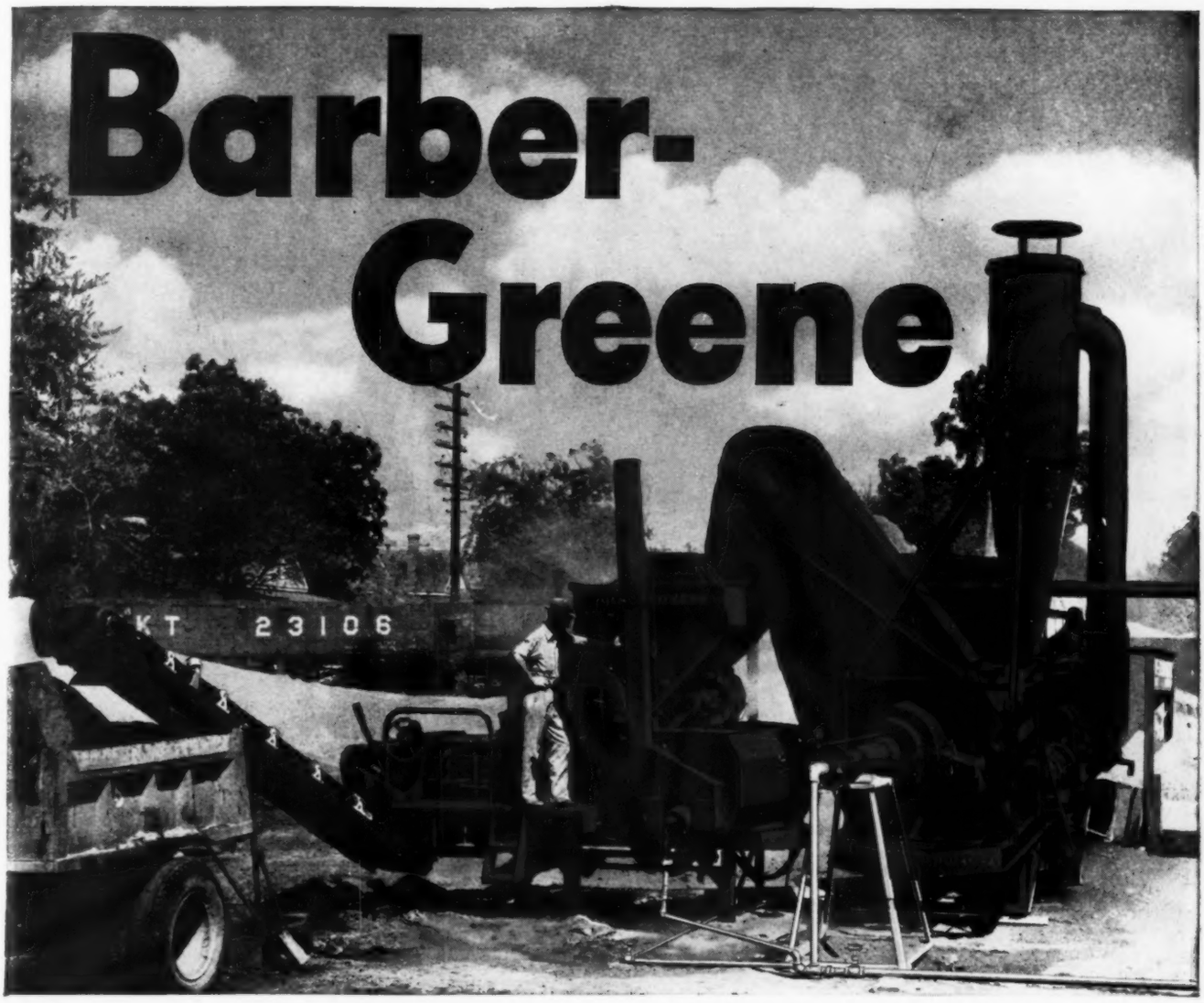
Like so many other leading contractors, B. B. McCormick & Sons has found that it's good profit insurance to use Gulf lubricants and fuels. Gulf quality lubricants provide an extra margin of protection against mechanical delays — and Gulf quality fuels help insure more efficient engine performance.

GULF

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

Boston	Pittsburgh	Houston
New York	Atlanta	Louisville
Philadelphia	NewOrleans	Toledo



Typical set-up of the Barber-Greene Maintenance Plant. Various combinations to meet your immediate needs may be easily arranged.

This *Small* Bituminous Mixing Plant Does a *BIG* Job!

Here's a complete, easy-to-operate, small bituminous mixing plant! It is specifically designed for maintenance and repair work, small road building projects and a variety of other surfacing jobs. The B-G Maintenance Plant will handle any type of mix, and its capacity is remarkable, considering its size and portability.

The B-G Maintenance Plant is truly portable and easily erected. Small enough to operate at low cost on maintenance and general repair work, it is still large enough to handle small construction projects. It operates on the same principles as the larger Barber-Greene Central Plant, measures the correct amount of aggregate and bitumen, thoroughly mixes them and discharges the mix into trucks.

It consists of two basic units—the 840 Mixer and 830 Aggregate Dryer. Each unit is equipped with a towing hitch and pneumatic tires to trail smoothly behind your truck when going from job to job. A complete line of auxiliary equipment available including Reciprocating Feeder, Bins, Dust Collector, etc. For illustrative literature, write Barber-Greene Company, Aurora, Illinois.

BARBER-GREENE COMPANY • AURORA, ILLINOIS

Constant Flow Equipment

LOADERS | PERMANENT CONVEYORS | PORTABLE CONVEYORS | COAL MACHINES | BITUMINOUS PLANTS | FINISHERS | DITCHERS

Portability at NO SACRIFICE of OPERATING EFFICIENCY

IN ROUGH GROUND

IN MUD

IN SAND

The Badger can be placed on the special wheel mounts shown in the photograph above in from 15 to 20 minutes; towed from job to job at motor truck speed, and dismounted in from 5 to 10 minutes. The center of gravity of the machine on wheel mounts is low, the bottom of the crawlers being but 9½" from the ground.

Once on the job, the crawler mounted Badger works at top efficiency regardless of whether the footing is smooth or rough, firm or soft. The ¾-swing design provides the lighter swinging weight and faster swinging speed that move more material on every job.

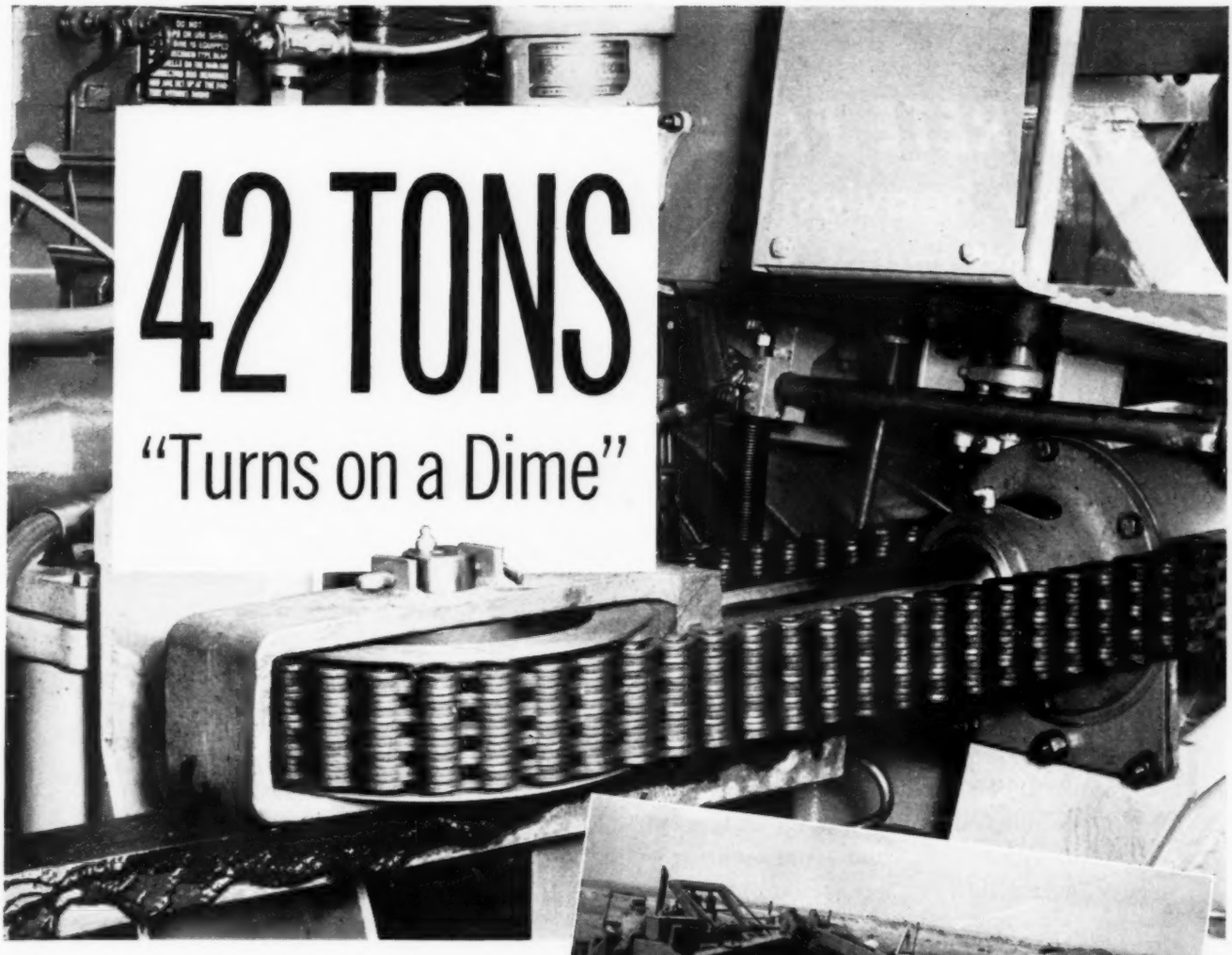
Money is made working, not traveling. In the great majority of cases it will be found that the superior performance of the crawler mounted unit as compared with a similar unit mounted on rubber will far more than compensate for the few extra minutes it takes to mount and dismount the crawler unit.

AUSTIN-WESTERN COMPANY • AURORA, ILLINOIS, U. S. A.

BUILDERS OF ROAD MACHINERY

Austin Western

SINCE 1859



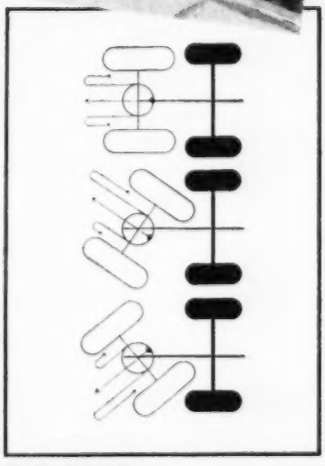
WHITNEY *Chain*

Helps give Terra-Cobra positive steering

The Wooldridge Terra-Cobra — massive self-propelled earth-mover — features among its advantages a unique two-wheel hydraulic steering mechanism. Actuated by the steering arm, the front wheels carrying the motor unit are swivelled and automatically locked at the desired degree of turn or travel until the operator wishes to change his direction. This "tru-control" steering means higher travel speeds without fear of jackknifing even on soft shoulders or embankments.

To assure positive transmission of power from the hydraulic pistons to the steering wheels, Wooldridge uses *Whitney* 1¼" pitch, 8 x 8, special cable chain. And for a good reason — these husky alloy steel chains easily withstand the severe high loading and shock loading conditions encountered in earth moving operations. For additional dependability, Whitney Roller Chains are also used to transmit power from the motor to the driving wheels.

Whether your equipment involves earth-movers or machine tools, it is good business to *standardize* on Whitney Chains and Cut Tooth Sprockets . . . *the all steel drives.* Write for complete information and specifications.



WHITNEY CHAIN & MFG. COMPANY
Division of Whitney-Hanson Industries Inc.
216 HAMILTON STREET, HARTFORD 2, CONNECTICUT

CONCRETE PAVEMENTS
carry heaviest traffic at lowest maintenance cost

OFFICIAL records of 28 State Highway Departments demonstrate a fact of utmost importance to highway engineers, state and county officials and taxpayers: ***Concrete costs less to maintain than any other type of pavement.***

The records cover 215,166.2 miles of highways in every state reporting maintenance figures by type of surface. Maintenance cost data average 16 consecutive years.

They show that it costs an average of only $109.84 per mile per year to maintain concrete pavement, and $137.54 for the pavement with the next lowest maintenance cost. Of the 12 types of pavements with at least 700 miles in service, the highest maintenance cost was $485.12.

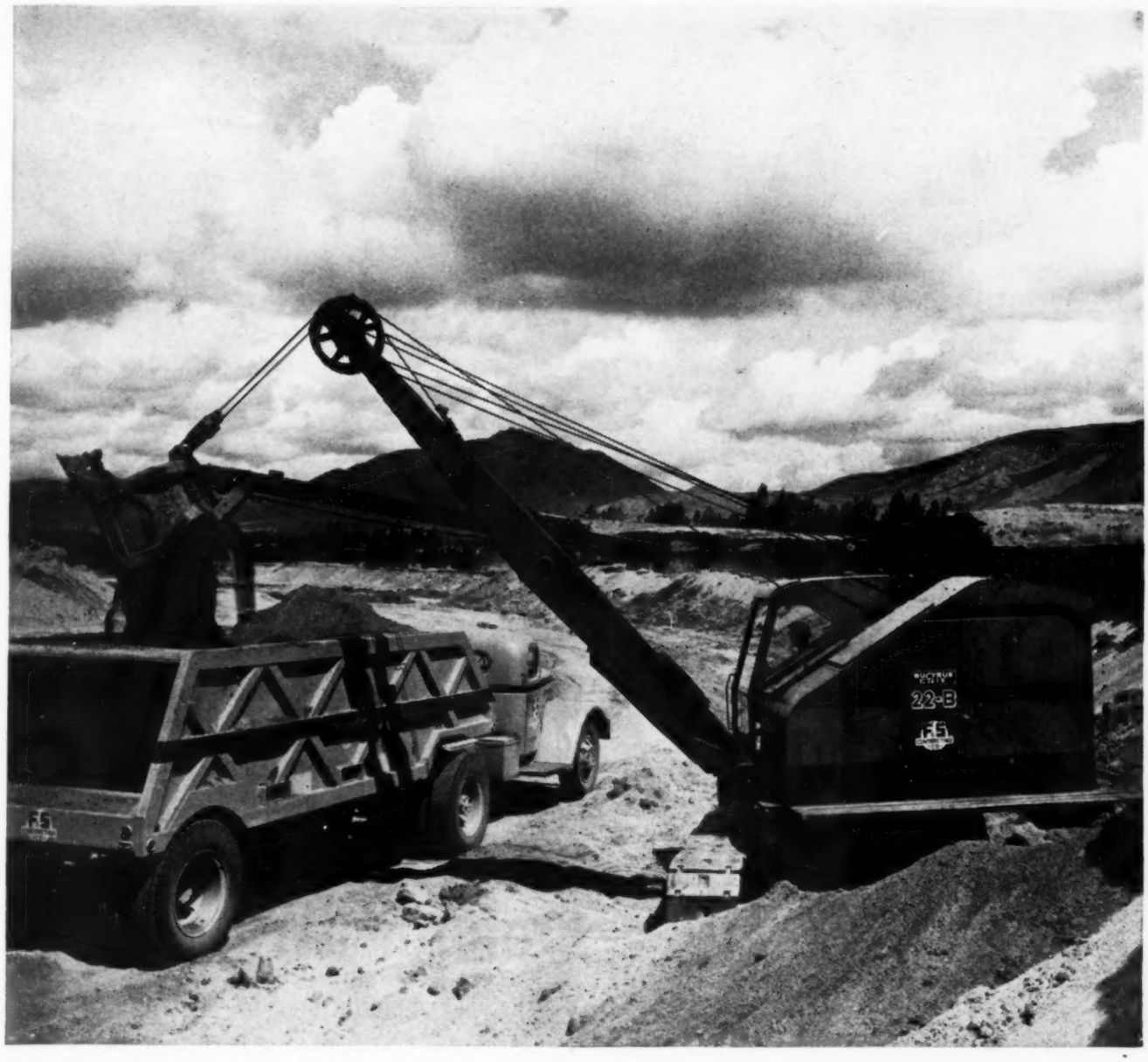
Concrete's low maintenance cost is significant because concrete highways usually carry the largest volume of heavy vehicles.

Low maintenance cost is only one of concrete's advantages. It also:

1. Is safer. At night concrete reflects the most light, thus increasing visibility. Night or day, wet or dry, concrete's gritty texture affords uniformly high skid resistance.
2. Usually costs less to build than other pavements of equal load-carrying capacity.
3. Renders more years of uninterrupted service.
4. Keeps driving costs low by saving on gas, tires and vehicle repairs.

For more details about pavement surface maintenance costs write for a free copy of "*Road Surface Maintenance Costs from 28 States*," distributed only in the United States and Canada.

PORTLAND CEMENT ASSOCIATION
Dept. 12-28, 33 W. Grand Avenue, Chicago 10, Illinois
A national organization to improve and extend the uses of portland cement and concrete ... through scientific research and engineering field work



Follow the lead of the leaders

Take a look at the excavating industry. Notice how consistently the leaders are Bucyrus-Erie equipped.

One reason they're leaders is that they recognize good equipment. They know it pays to choose machines that deliver steady high production . . . machines that stay on the job and out of the shop.

So follow the lead of the leaders. You'll find that for sustained output in rock or dirt your best buy is Bucyrus!

BUCYRUS ERIE

The BEST buy Bucyrus, the best BUY in excavators

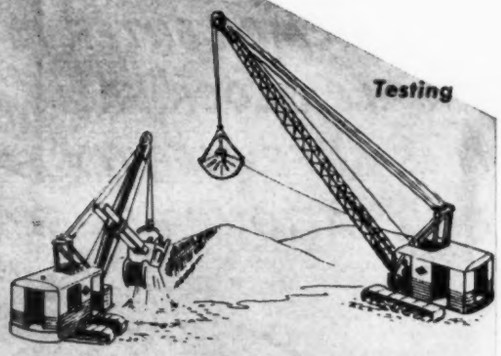
Bucyrus-Erie Company
South Milwaukee, Wisconsin

136E48

Most Advantageous
. . . Because it costs so little more, there's no longer one valid reason for using any wire rope but
Preformed Wire Rope
Ask your manufacturer or distributor to tell you why Preformed wire rope lasts so long, why it handles so easily, and why it saves you so much time and money.

LIMA helps you keep your LIMA equipment ON THE JOB!

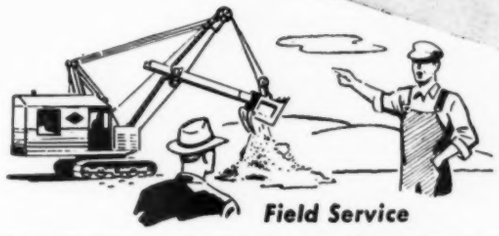
Design Engineering



Testing

We, at LIMA, recognize how important it is to our customers to keep equipment operating continuously. We know that in most cases shovel or crane failure "shuts down the works". That's why we have established a hard and fast policy of doing everything we can to *make LIMA equipment STAY ON THE JOB!*

Service Bulletins



Field Service

FIRST, our engineers have designed a machine with extra ruggedness and stamina to take the punishment they know it will get. Capacities are achieved by proper design and rugged construction rather than by adding dead counterweight. Many exclusive features are built in to provide greater endurance. Each machine is subjected to gruelling tests on our own proving ground before shipment.

SECOND, we assume the obligation of providing our customers and their operators with complete instructions as to proper handling and maintenance.

THIRD, we take a keen personal interest in every machine sold. Our agents and service engineers are always at your service—to keep your equipment at top efficiency *on the job.* Orders for maintenance parts get the green light in our shipping department—and are dispatched the same day whenever possible. We are as concerned as you are to keep your "down-time" to a minimum.

The LIMA line includes: SHOVELS—¼ to 6 yds. CRANES—13 to 100 tons—DRAGLINES—Variable

LIMA Type 802 shovel with 24'-6" boom and 2 cubic yard dipper excavating rock

Lima Shovel and Crane Division

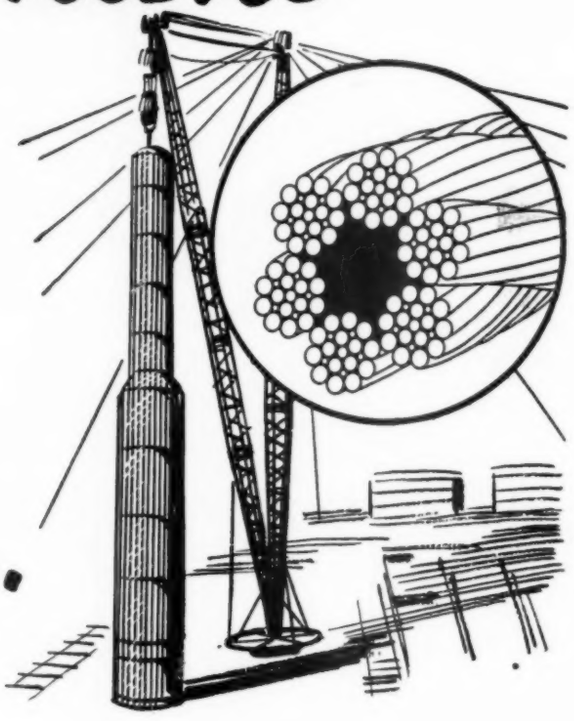
LIMA, OHIO

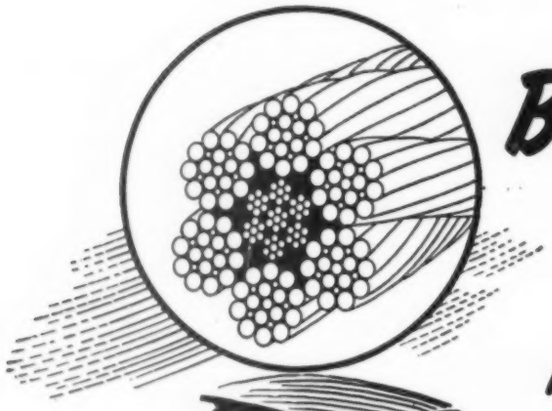
OTHER DIVISIONS: *Lima Locomotive Works Division; Niles Tool Works Co.; Hooven, Owens, Rentschler Co.*

LIMA HAMILTON CORPORATION

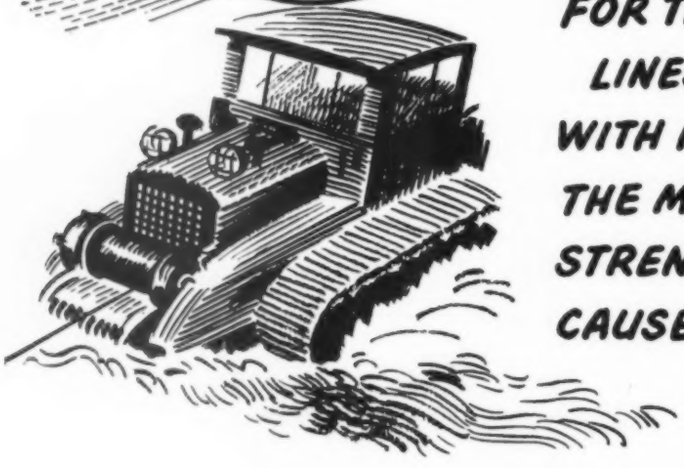
SOME ROPES FOOL YOU

U-W 6×19 FILLER WIRE CABLE WITH HEMP CENTER IS OK FOR TACKLE BLOCK FALLS BECAUSE IT IS SUFFICIENTLY FLEXIBLE AND FATIGUE RESISTANT





BUT...



FOR TRUCK AND TRACTOR WINCH LINES U-W 6×19 FILLER WIRE WITH I.W.R.C. IS BETTER BECAUSE THE METALLIC CENTER ADDS MORE STRENGTH AND RESISTS CRUSHING CAUSED BY DRUM CROSS WINDING

For longest and best service, always specify
U-W LAYRITE (*Preformed*) IMPROVED PLOW STEEL

UPSON-WALTON IS THE ONLY MANUFACTURER OF ALL 4•••
Wire Rope, Tackle Blocks, Wire Rope Fittings, Brattice Cloth.
We invite you to let us engineer your problem jobs.

Copyright 1948—The Upson-Walton Company

THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks, Brattice Cloth

Main Offices and Factory: Cleveland 13, Ohio

114 Broad Street, New York 4 | 3525 West Grand Ave., Chicago 51 | 241 Oliver Building, Pittsburgh 22

ALL THIS IN JUST 14 DAYS!

WEAVER CRANE SERVICE, Inc.
CHARLESTON, W. VA.

traveled 750 miles over mountain roads — set 31 underground storage tanks in

11 West Virginia cities with a single MICHIGAN TRUCK-CRANE

...half the time required by less mobile equipment!

Weaver Crane Service, Inc., operates throughout the state of West Virginia, placing and removing underground storage tanks for a nationally-known petroleum company. They are highly pleased with MICHIGAN'S truck mobility and stamina on the mountainous roads of West Virginia. In the words of Mr. Albert Weaver, "it has given exceptionally good service . . . Had this work been done with a less mobile machine, the same trip would have taken at least thirty days . . . I am proud of my MICHIGAN Crane."

This is typical of the praise of MICHIGAN Shovel-Crane owners everywhere. Get all the facts about MICHIGAN — ask for your copy of "MICHIGAN ON THE JOB" which graphically shows the wide range of cost-cutting applications of these pioneer mobile shovel-cranes.

MICHIGAN

MICHIGAN POWER SHOVEL COMPANY
485 SECOND STREET, BENTON HARBOR, MICHIGAN, U.S.A.

your drainage dollars can be S-T-R-E-T-C-H-E-D

Costs are high and budgets won't stretch; yet you may be pleasantly surprised to see how far you can make those dollars go with ARMCO Drainage Products. At the same time you can stick to your determination of using the very best materials in the interest of public safety and economy.

Road builders have found ARMCO Corrugated Metal Products an especially wise choice when faced with the problem of building culverts, stream enclosures, bridges and other drainage structures at reasonable cost. This is why:

All ARMCO Corrugated Metal Structures have a high strength to weight ratio. Transportation costs are low. They are easily handled and installed by unskilled workmen. Less time is needed to finish the job. Labor costs are low.

Material costs are low because you choose exactly what you need in a wide range of sizes from 6-inch round pipe to a 24-foot MULTI-PLATE Arch. For severe corrosion there is ASBESTOS-BONDED Pipe, while a PAVED-INVERT will guard against erosion. And either standard Corrugated PIPE-ARCH or MULTI-PLATE PIPE-ARCH is just the thing for limited headroom.

These are some of the time- and money-saving reasons why ARMCO Products help stretch your drainage dollar. Talk over that next problem with the ARMCO Engineer or write us for complete information. Armco Drainage & Metal Products, Inc., 2685 Curtis St., Middletown, O.

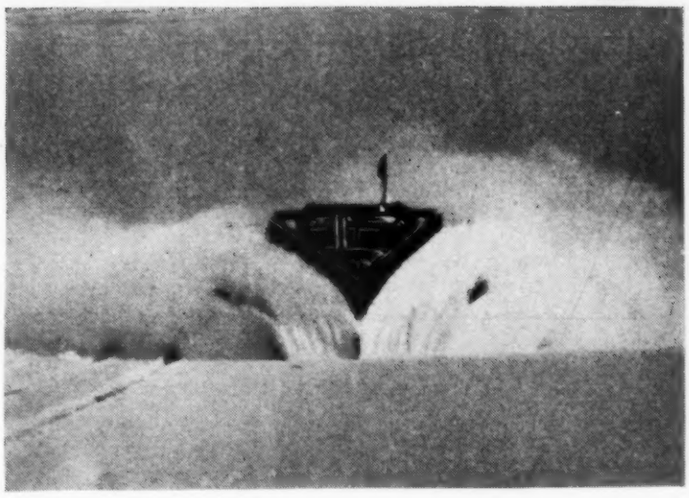
Export: The Armco International Corporation.

ARMCO

ARMCO DRAINAGE PRODUCTS

How to s-t-r-e-t-c-h highway budgets!—

One of the biggest headaches in highway budgets, is the unpredictable item of snow removal costs. One way to come out ahead is to get a break in the weather, but the surest way, year in and year out, is to be equipped with the fastest, most powerful, high-capacity snow removal equipment . . . Walter Snow Fighters.



Your investment in *WALTER SNOW FIGHTERS* pays greater dividends

• FASTER, LOW-COST CLEARANCE

The tremendous power and unfailing traction of Walter 4-Point Positive Drive, clears at higher speeds, removes greater volume on each run. You clear more miles per hour, at lower cost. You need fewer units to do the job. You are equipped to handle any snow conditions, from average falls to raging blizzards—from hardpacked ice and snow, to deepest drifts.

• FEWER TIE-UPS

Your community losses due to blocked roads are reduced to a minimum with Walter Snow Fighters because your roads are opened fast and kept open throughout the storm.

• ALL-YEAR USEFULNESS

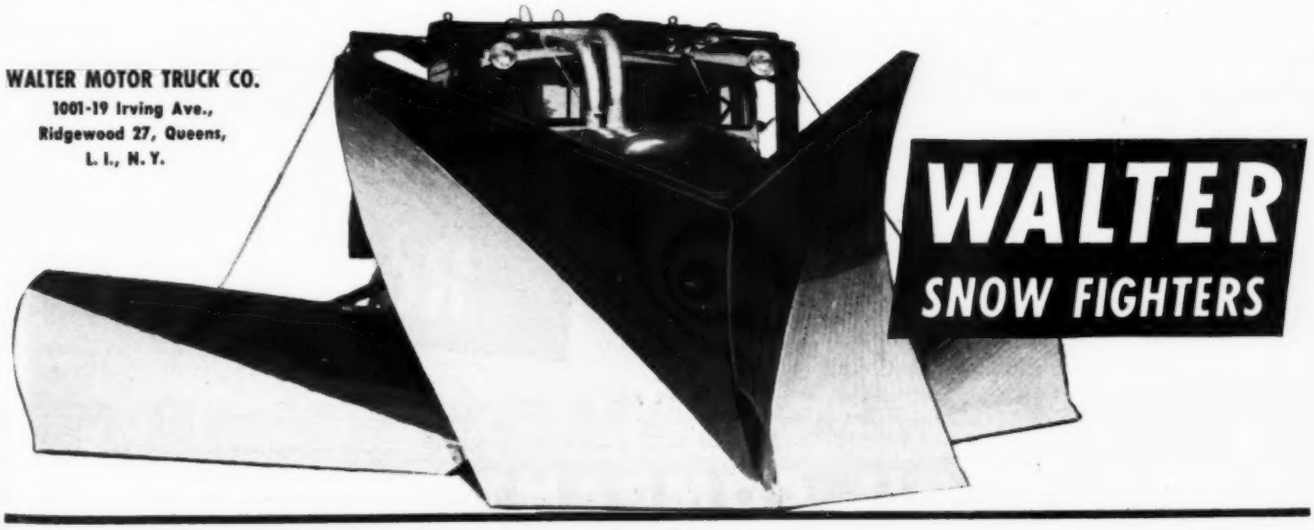
With the plows removed, Walter Snow Fighters give you outstanding heavy-duty trucks for service on and off the highway. They keep busy on road scraping and maintenance, construction jobs, hauling, emergency work, etc.

• YEARS OF SERVICE

Many Walter Snow Fighters are still operating at top efficiency after 10, 15 and 20 years of constant service. You can expect the same from today's advanced Walter Snow Fighters.

See your Walter distributor for full details—or write us for literature.

WALTER MOTOR TRUCK CO.
1001-19 Irving Ave.,
Ridgewood 27, Queens,
L. I., N. Y.



Road builders report

4 ADVANTAGES

of new and improved Standard Oil Road Oils

- Better wetting or coating of aggregate
- Greater stickiness and binding quality
- Faster setting of roads
- Blacker appearance

Contractors and highway engineers who have used the improved Standard Oil Road Oils during the past season report the above outstanding advantages of this product.

Roads laid with the improved Standard Road Oils wear longer because the aggregate is bound tightly into the road surface. Faster setting means less traffic delay.

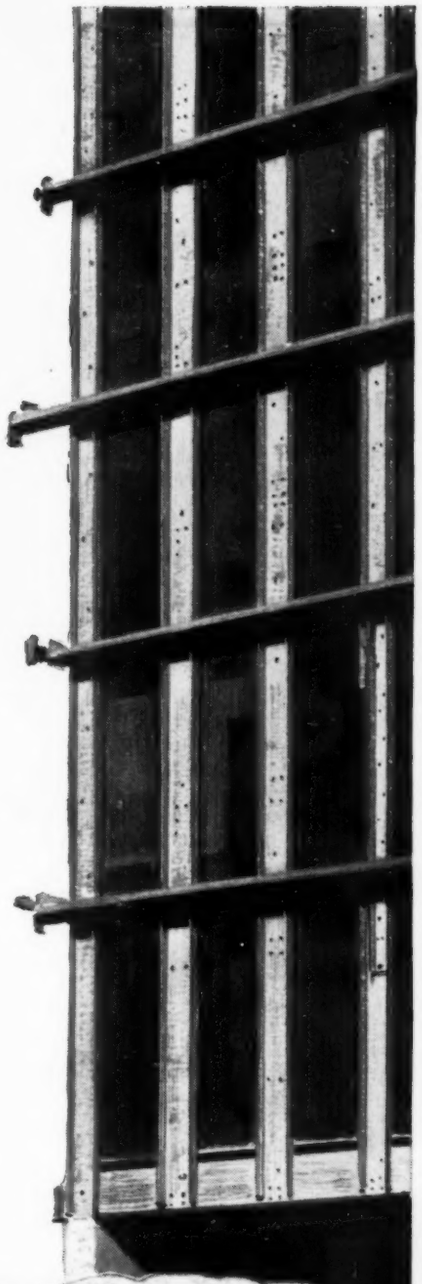
Ask a Standard Oil Asphalt Representative for all the facts about this improved road oil. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

Standard Oil Road Oils

STANDARD OIL COMPANY (INDIANA)

STANDARD

Built to take a 10-ton load off your mind!



Wheeling a 10-ton load is as routine as easing over a 10-inch bump to this big International six-wheeler!

That's because it's packed with power from bumper to tailgate. It's built to make tracks through sand, muck, and mire, to fight its way up grades that would knock the heart out of an ordinary truck.

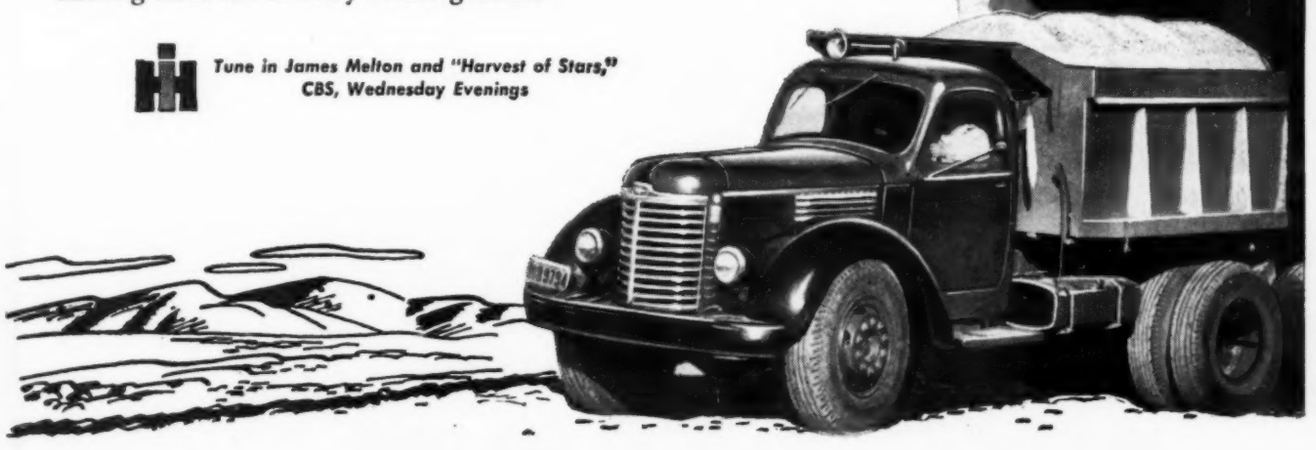
Performance like this is a habit with Internationals. There are 22 basic models, eight of them six-wheelers—each a champion in its own right.

Whether their gross weight rating is 90,000 or 4,400 pounds, they all rate tops in driver advantages as well as performance. Drivers swear by 'em because they do a good job fast and take a beating without giving the driver one.

And that's not all. You'll find yourself swearing by 'em when you discover how easy they are to service. Thousands of International Dealers and 170 company-owned Branches—coast to coast—offer you the nation's largest exclusive truck service organization. Whether at home or 3,000 miles away, you can get International service, precision-engineered parts, factory-built exchange units and whatever your International needs . . . quickly and at low cost.

So, whether you haul gravel, granite, sand or cement—it will pay you to find out what the "Standard of the Highway" can do for you. The sooner you do this, the quicker you will start getting more hauling miles out of every trucking dollar.

Tune in James Melton and "Harvest of Stars," CBS, Wednesday Evenings



INTERNATIONAL TRUCKS

MOTOR TRUCK DIVISION • INTERNATIONAL HARVESTER COMPANY • CHICAGO

THE PIONEER BUZZER is a small, compact screen that attaches to the delivery end of a conveyor. 18 square feet of *live wire* screen produce about 50 tons of material an hour.

New
Low-cost
Continuflo
GRAVEL PLANT

MAKES SMALL JOBS PROFITABLE

● Here's a new portable screening and loading plant that *makes small jobs profitable.* As units they're . . .

The Pioneer Buzzer Screen
The Pioneer Hydraulic Conveyor Truck
with Conveyor and Feeder

Together, they're one of the sweetest portable screening and loading plants you've ever seen. Hauled behind a truck, set up anywhere in twenty minutes, produce as much as 500 tons of specification gravel in a day.

Want more information about this profitable pair? Then, write today for complete details about Pioneer's new Buzzer Screen and the Hydraulic Conveyor Truck.

PIONEER ENGINEERING WORKS
1515 CENTRAL AVENUE • MINNEAPOLIS, MINNESOTA

IN NINE MINUTES, one man can easily elevate a 50′ conveyor with this new Pioneer Hydraulic Conveyor Truck. A twist of a valve and it's back in its cradle . . . ready for another move. Handles conveyors up to 50′ in length with belts as wide as 30″. A reciprocating plate feeder mounted on the conveyor completes the plant.

BUY BOTH!
Higher Output, Lower Upkeep!

Pioneer
Continuflo **EQUIPMENT**

An Enthusiastic User Reports:

"THE TIP-TOP TRAILER IS ONE OF THE MOST USEFUL AND TIME-SAVING PIECES OF EQUIPMENT WE HAVE EVER OPERATED"

The above is a typical reaction of users who have tried and proven to their own satisfaction that TIP-TOP Trailers offer advantages possessed by no other trailer.

Designed on an entirely new principle, TIP-TOP cuts loading and unloading time to a matter of a few minutes. Yet the operation is both safer and easier, as all need for blocking, skidding and winching is eliminated.

In addition to their exclusive features, TIP-TOP Trailers have a wide range of general utility uses. Practically any type of material, such as lumber, steel, pipe, etc., can be hauled.

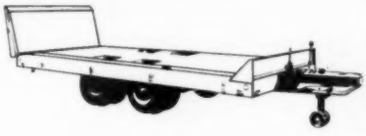
SPECIFICATIONS: Sturdily constructed with pressed steel frames, TIP-TOP Trailers are available in 7-ton capacity (single axle) and 12-ton capacity (tandem axle). A liberal factor of safety is provided for unavoidable overloads. Trailers are equipped with approved lights and reflectors, vacuum or air brakes and comply with all state laws.

INQUIRIES AS TO OPEN TERRITORIES ARE INVITED FROM QUALIFIED DISTRIBUTORS.

ARTHUR REHBERGER & SON, Inc.
320 Ferry Street Newark 5, N. J.
VEHICLE MANUFACTURERS FOR OVER SIXTY YEARS

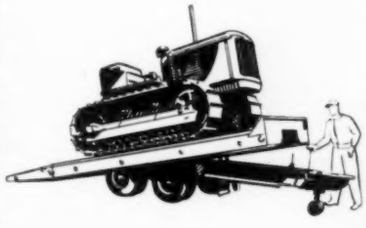
TIP-TOP TRAILERS MAKE LOADING and UNLOADING AS SIMPLE AS THIS!

1. Trailer before loading.



2. Tail skid is lowered and loading platform is raised by hydraulically controlled, hand operated pump.

3. Equipment is driven on under its own power with tail skid serving as ramp. Release valve is then opened so that loading platform will return to its original position and automatically lock. The tail skid is then hydraulically raised to shorten overall vehicle length and to serve as barrier for load.
In unloading, same procedure is followed and equipment is driven off under its own power.



TIP-TOP TRAILERS

Patent Pending

For additional information on TIP-TOP Trailers, write for folder

MM
MINNEAPOLIS MOLINE
MODERN MACHINERY

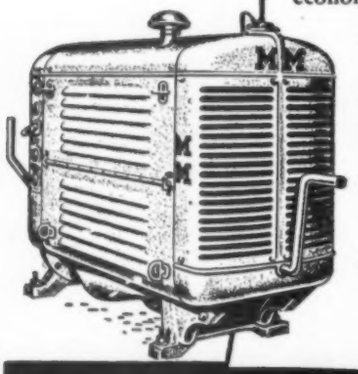
INDUSTRIAL WHEELERS *Cut* HANDLING COSTS

Roll back loading costs with the new UTIL Shuttle Wheeler! A new shuttle gear gives 6 reverse speeds at 85% of the 6 forward speeds (1.8 to 14.5 m. p. h.). Since loader operation is 50% forward and 50% reverse travel, UTIL *fast reverse speeds* and *quick change* from forward to reverse gear cut time on every load!

MM Roller Spin Steering permits steering wheel to roll easy with capacity loads. Heavy-duty front-end 10,000 lb. tire capacity and engineered design *minimizes road shock* and operator fatigue.

See Your MM Dealer-Distributor or Write

MM INDUSTRIAL POWER UNITS for hoists, electric generators, rock crushers, pumps, compressors, cranes, shovels, and many other industrial uses give excellent performance and economy . . *proved* adaptability!

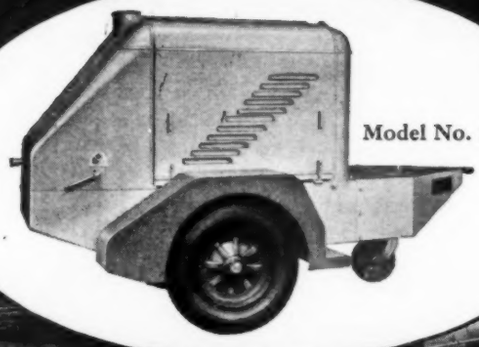


- *High-turbulence combustion chamber!*
- *Controlled cooling!*
- *Exclusive MM Heat Exchanger Base Pan!*
- *Oil pressure and water temperature safety cutouts!*
- *Removable cylinder heads and blocks!*

From 25 to 230 h.p.

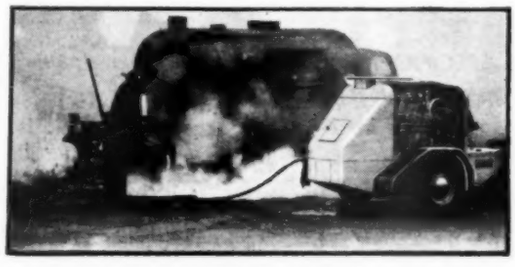
MINNEAPOLIS-MOLINE
POWER IMPLEMENT COMPANY
MINNEAPOLIS 1, MINNESOTA

THERE'S NO WARM UP TIME NEEDED WITH A
"TANKAR" STEAM HEATER
IT GOES TO WORK INSTANTLY



Model No. 115

Now you can unload a tank car of Asphalt, Tar, Emulsion, etc., in one-third less time than ordinary units. In addition, you can clean equipment, degrease garage floors, heat buildings and a dozen other uses! The Littleford *"Tankar" Steam Heater produces steam up to 200 lbs. pressure from a cold start in 2 minutes time.* Just think of it! Ready to work in 2 minutes time! Where can you find a unit that is such a time and money saver? In addition to speed of operation, the "Tankar" Steam Heater is compact, full automatic, sturdy in construction and fast trailing. A *"Package of Steam" is this unit.* Write for Bulletin No. 21.



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BROS *ASSURES* Faster Loading, Economical Operation

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The *Bros* Sno-Flyr takes care of both—it gives you fast removal and economy.

The Sno-Flyr is *fast* and *powerful*. Cutting a 14-foot swath at speeds up to 25 miles per hour, it keeps up with the storm . . . goes through the very toughest banks.

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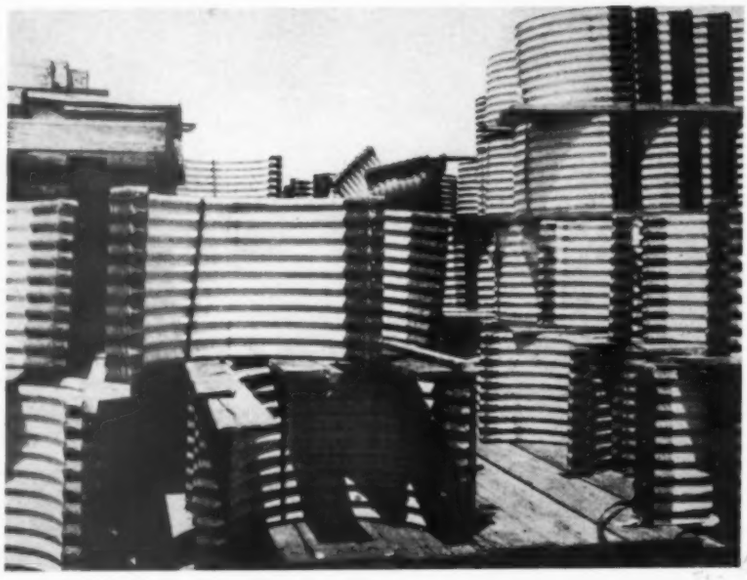

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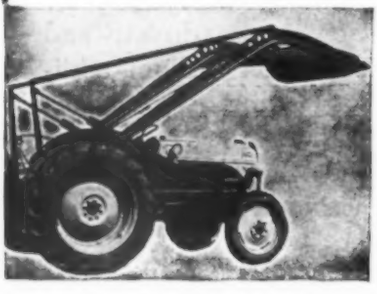
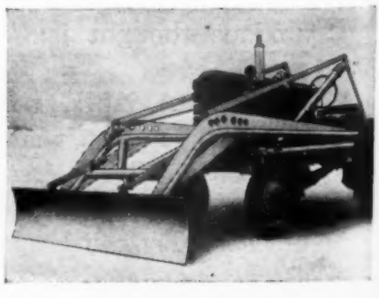


A TWIN CYLINDER HYDRAULIC LOADER DESIGNED FOR SERVICE



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The twin cylinder operation lifts 1,690 pounds with ease. Easily installed and maintained. A sturdy, balanced unit of proven design.

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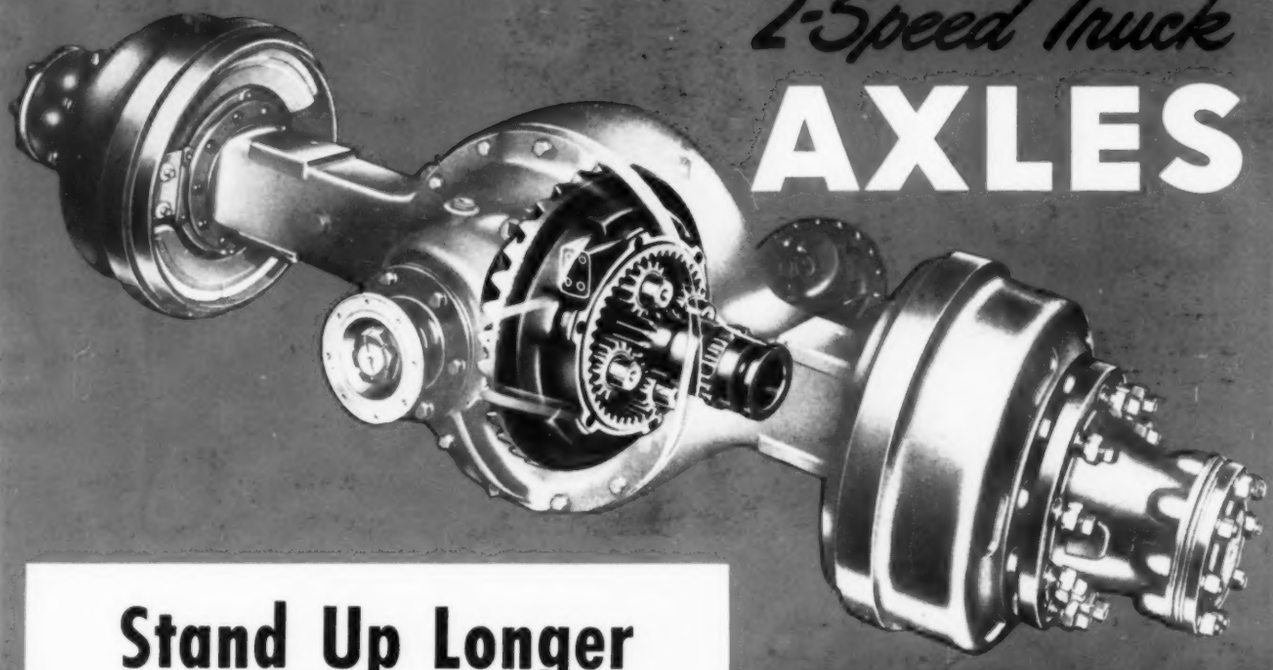
AXLES



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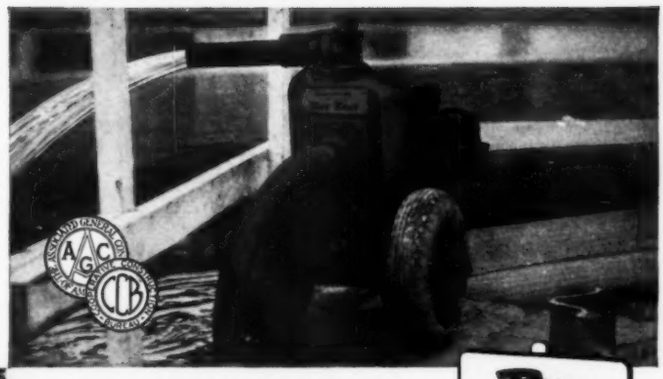

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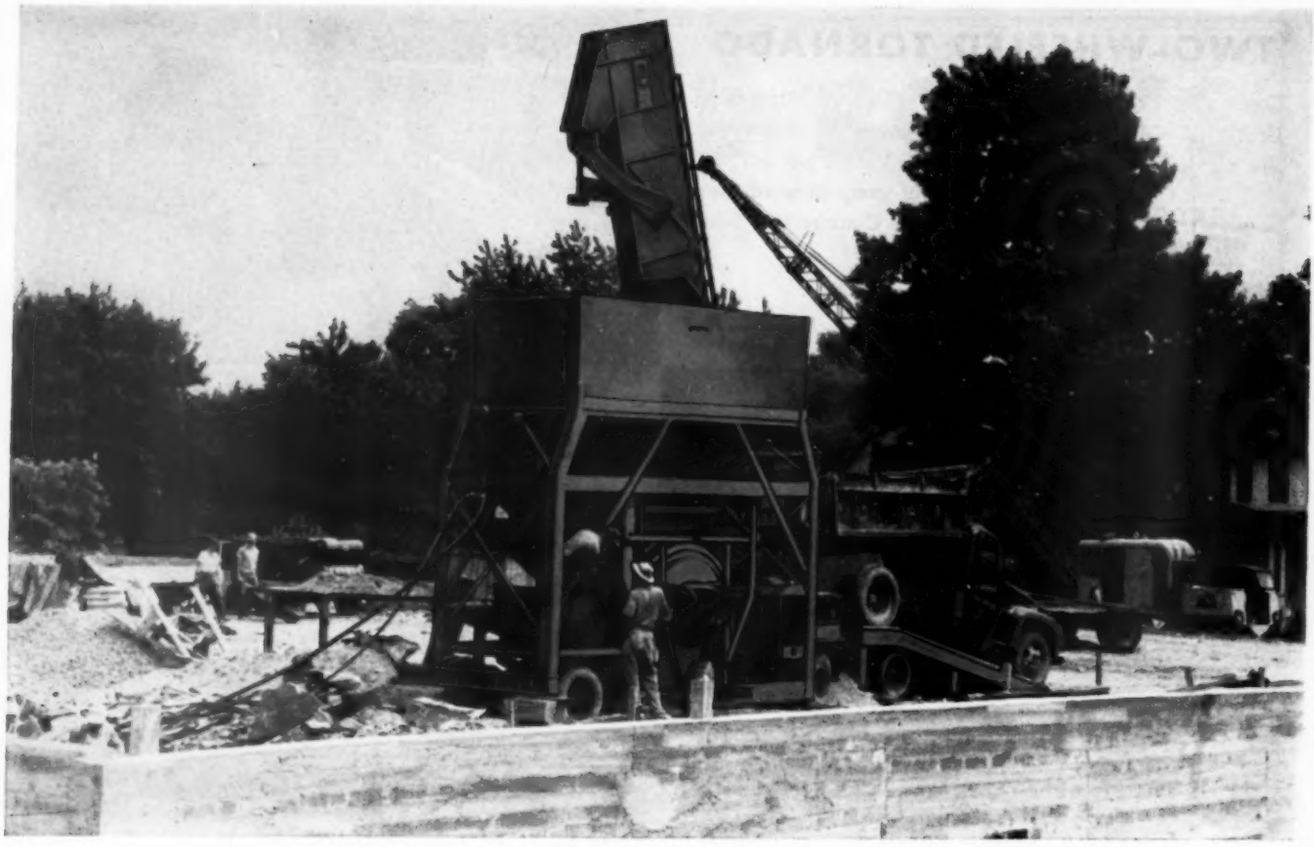

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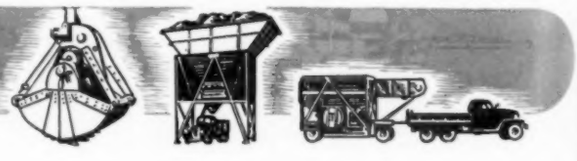

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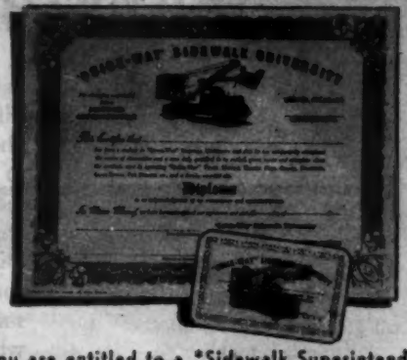

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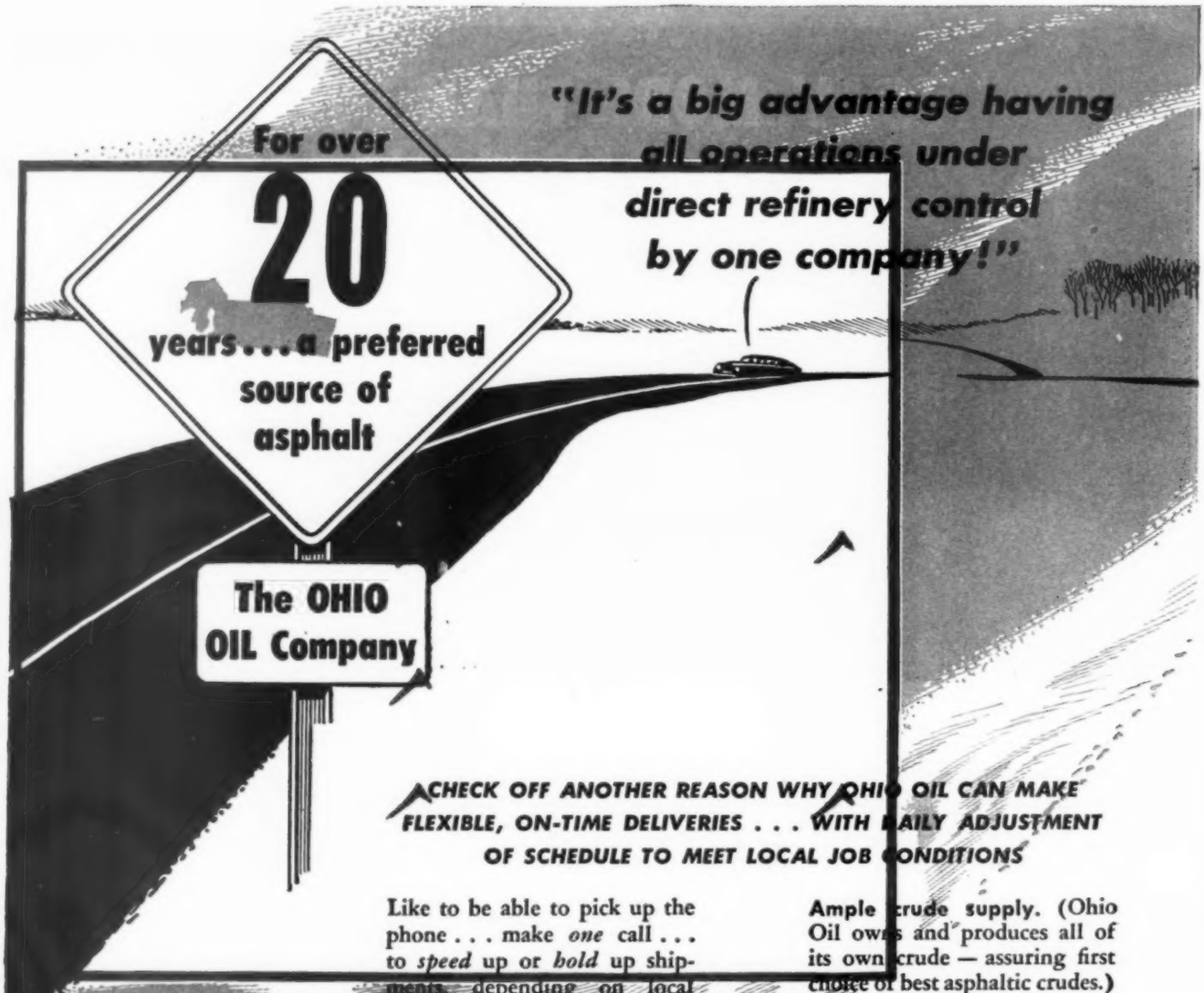
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years . . . a preferred source of asphalt
"It's a big advantage having all operations under direct refinery control by one company!"
The OHIO OIL Company

CHECK OFF ANOTHER REASON WHY OHIO OIL CAN MAKE FLEXIBLE, ON-TIME DELIVERIES . . . WITH DAILY ADJUSTMENT OF SCHEDULE TO MEET LOCAL JOB CONDITIONS

Like to be able to pick up the phone . . . make *one* call . . . to *speed* up or *hold* up shipments, depending on local weather or other conditions? Direct refinery control by one company is an important reason why you can do just that when your supplier is Ohio Oil.

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Contact nearest office or state representative for all grades of asphalt and asphalt cements

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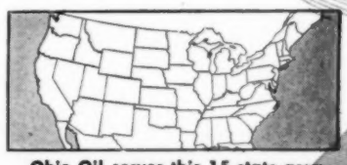

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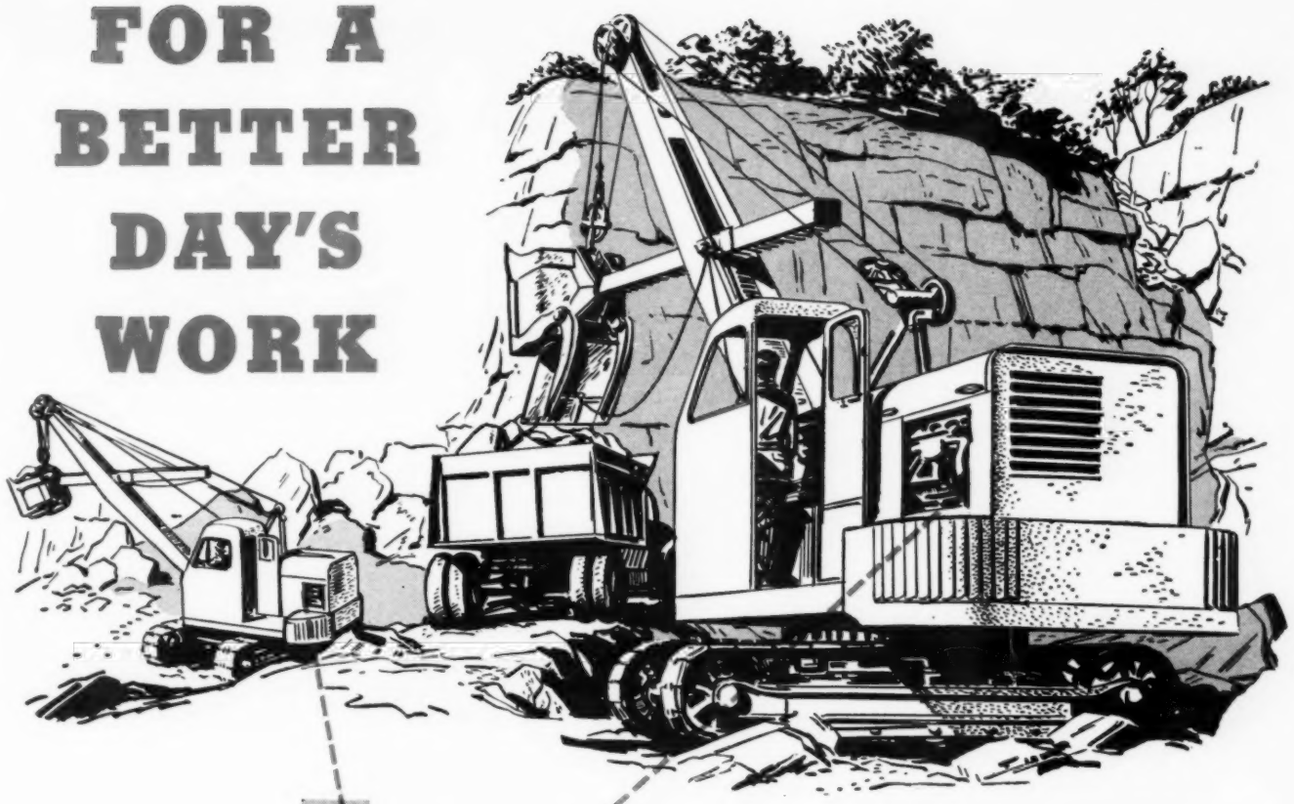
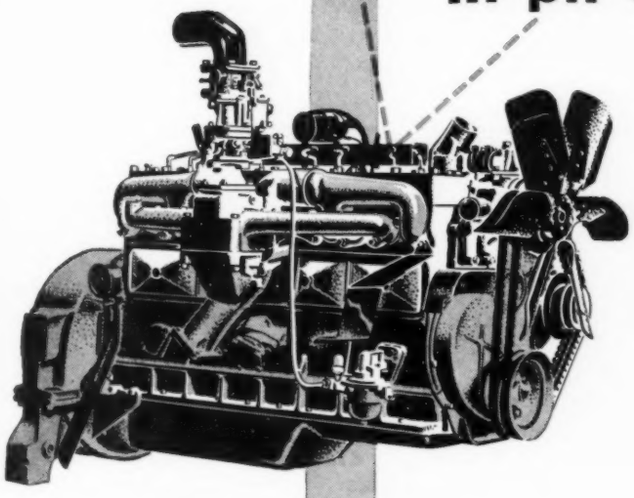


in pit and quarry operations



Where digging is tough and tricky . . . where steady, dependable power is the difference between profit and loss . . . you'll find Chrysler Industrial Engines and Power Units on the job! Chrysler Industrial Engines provide power *for a better day's work* on cranes, shovels, pumps, cableways, conveyors, drills, crushers and in other mining or quarrying equipment. For economical power that's tailored to *every* industrial application, see the Chrysler Industrial Engine dealer near you; for detailed data and specifications, write . . .

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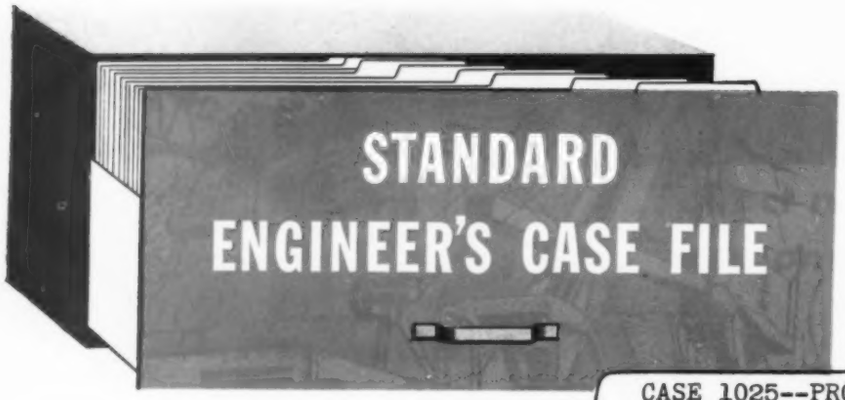
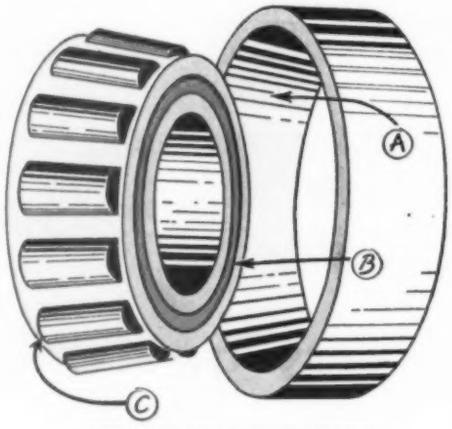


CASE 1025--PROVIDING CONSTANT LUBRICATION IN WHEEL BEARINGS.



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Wheel bearings in trucks hauling heavy loads in desert heat, winter cold and rain, were in perfect condition long after usual servicing periods when the bearings were lubricated with RPM Wheel Bearing Grease. Recommended for all sizes and types of wheel bearings. Apply to bearing assemblies by hand or with mechanical lubricators.

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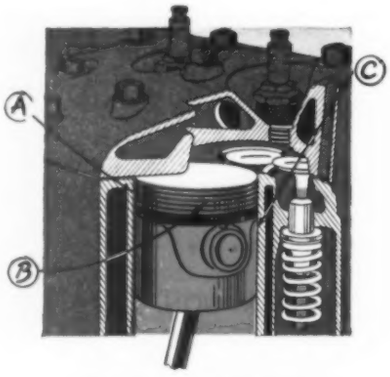
B. Feeds slowly to bearing parts ... resists extreme temperatures - will not melt and run from hubs onto brakes.

C. Stays in smallest bearing clearances.

RPM Wheel Bearing Grease provides good lubrication in the presence of water.

CASE 1017--REDUCING OVER-HAULS IN GASOLINE ENGINES.



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When gasoline engines were lubricated with compounded RPM Motor Oil, pistons, cylinders, valve stems and other oil-contacted parts remained clear of carbon, gum and lacquer. Wear was minimized and rusting was not a problem. Recommended for gasoline engines. Five grades: SAE 10/10W to SAE 50.

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B. Sticks to hot spots - reduces usual wear on upper cylinders and pistons.

C. Adherence to cylinders when engine is idle minimizes starting wear and prevents rusting - moisture will not cut through oil film.

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TRUCK MOUNTED SHOVEL • TRENCH HOE
DRAGLINE • CLAM • PILEDRIVER • CRANE

These BANTAM features mean longer life, lower maintenance costs, easier operation and more operating hours on the job.

VERSATILITY

6 profit-makers in one machine. Convertible in minutes from shovel to trench hoe, dragline, clam, piledriver, crane. Interchangeable split type laggings give high performance on all operations.

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The BANTAM is balanced for mounting on any 1½ ton truck. Drives up to the job and digs in. Saves time where time counts. Ideal for operation in tight spots. Also available on half-tracks.

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All major shafts, gears, and drums roll on ball bearings. Means easier operation, greater economy, less downtime on the job.

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CHAPTER 1. INTRODUCTION—Brief discussions of construction costs, prices, profits and the uses of cost data.

CHAPTER 2. COST INDEXES—Indexes of the U. S. Public Roads Administration and Interstate Commerce Commission, with brief explanations of their construction, uses and limitations.

CHAPTER 3. OVERHEAD COSTS—Separate discussions of the overheads incurred by contractors and by states, counties and cities.

CHAPTER 4. ENGINEERING—Data from states, cities and other sources on the costs of various kinds of surveys and other engineering. There are brief articles on aerial surveys and seismographic soil and rock surveys.

CHAPTER 5. RIGHT-OF-WAY—A general discussion followed by records of actual experience and costs.

CHAPTER 6. EQUIPMENT—This chapter contains several rental and ownership expense schedules in full detail, followed by articles on operating and maintenance costs, including records of fuels, lubricants, etc., a mathematical analysis of the problems of selecting and retiring machines, and a table of depreciation rates.

CHAPTER 7. LABOR—Schedules of established minimum wage scales and records of wage rates in various states; comparisons of contract work and day labor; convict labor costs and other pertinent matter.

CHAPTER 8. CLEARING AND GRUBBING—Records of clearing with tractor-mounted equipment, hand and horse methods, stump blasting, etc.

CHAPTER 9. GRADING—Eighty-four pages of articles on grading with power shovels, scrapers of various types and sizes, elevators, blade graders, bulldozers, etc.; hydraulic grading; rock drilling and blasting; winter grading; special swamp grading; minor operations and hand work.

CHAPTER 10. HAULING AND HANDLING MATERIALS—Studies of hauling operations on power shovel jobs, concrete construction and bituminous construction; truck movements at yards; industrial railways; team and wagon hauling; and other articles.

CHAPTER 11. PRODUCTION OF AGGREGATES—Articles on labor requirements and costs of producing sand, gravel and crushed stone at various locations.

CHAPTER 12. UNTREATED BASES AND SURFACES—Waterbound macadam, crushed rock and gravel construction.

CHAPTER 13. STABILIZATION OF BASES AND SURFACES—This chapter is devoted chiefly to work with calcium chloride, articles on portland cement and bituminous stabilization being given in the chapters on concrete and bituminous construction.

CHAPTER 14. BITUMINOUS SURFACES AND BASES—The five parts of this long chapter contain articles on various methods in different states: Part 1. Surface Treatments; Part 2. Bituminous Macadam; Part 3. Mixed-in-Place Construction; Part 4. Traveling Plant Construction; Part 5. Stationary Plant Construction.

CHAPTER 15. CONCRETE SURFACES AND BASES—Contains numerous detailed records of construction. There are articles on work with 27-E pavers, 34-E pavers, tandem setups, batching, hauling, curing, joints, cement-bound macadam, soil-cement roads, stabilization, and other subjects.

CHAPTER 16. BRICK PAVEMENTS—Records of brick pavement construction from various cities and states, including and article on vibrated monolithic. Short reference to granite block.

CHAPTER 17. SIDEWALKS, CRUBS AND GUTTERS—Miscellaneous prices and details of construction.

CHAPTER 18. WALLS, FENCES AND GUARD RAILS—A brief chapter of data on these items of highway construction.

CHAPTER 19. BRIDGES AND CULVERTS—Cost data on a large number of steel, concrete and timber bridges and grade separations—also culverts of various types. There are two articles on pump installations for underpass drainage.

CHAPTER 20. TUNNEL CONSTRUCTION—Detailed descriptions and data on the construction of 27 highway tunnels in the West.

CHAPTER 21. GRASS, SHRUBS AND TREES—Several articles on plantings for landscape improvement and bank protection.

CHAPTER 22. MISCELLANEOUS—Data on pedestrian underpasses, street car loading platforms, truck weighing stations, catch basins and manholes, lignin binder, water pumping, signs and markers, traffic striping, parking meters, highway lighting, radio communication with snow plows, accident prevention, and weather and construction.

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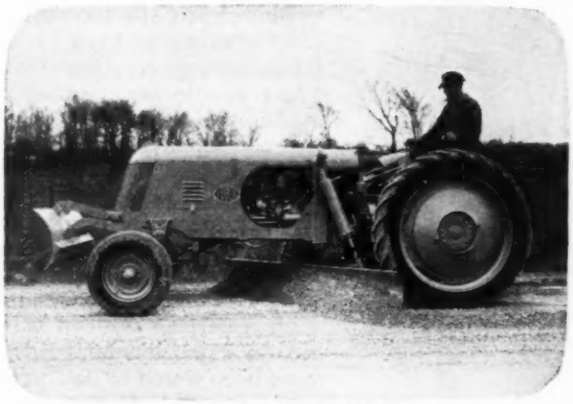

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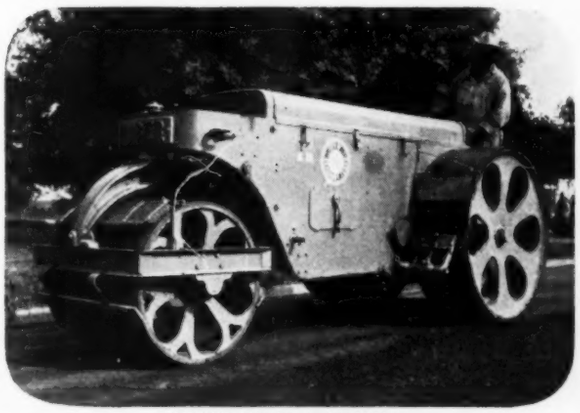

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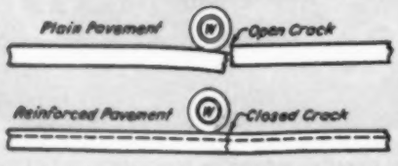

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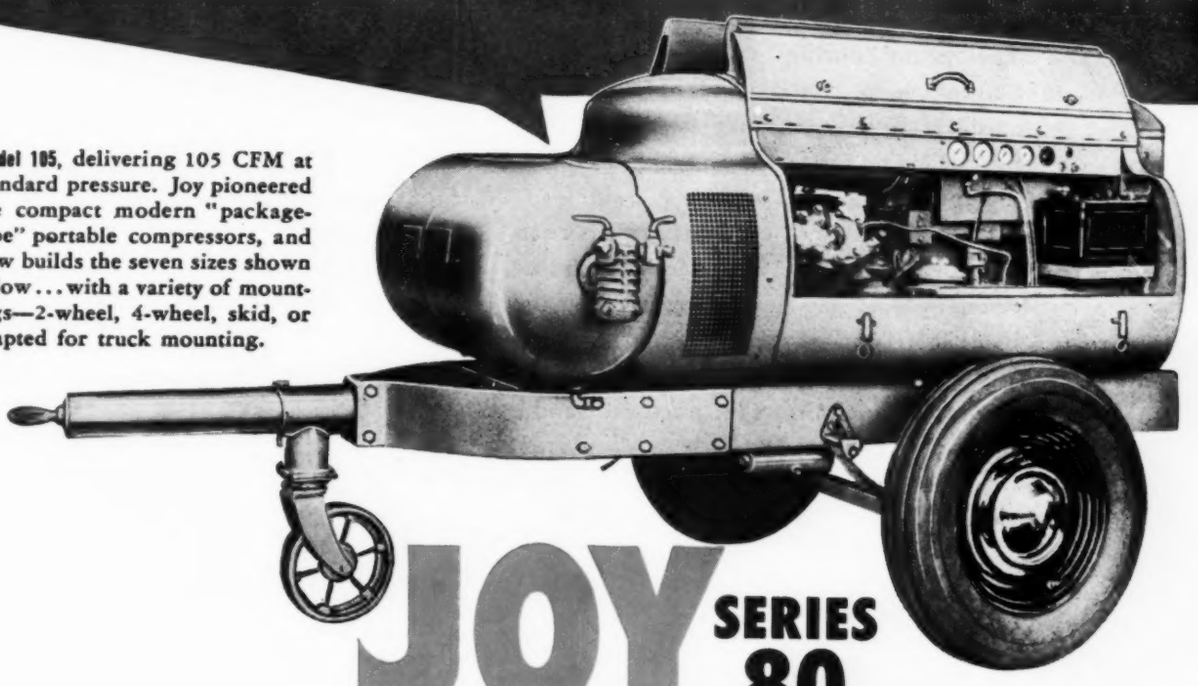

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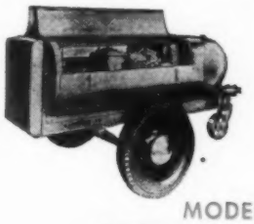

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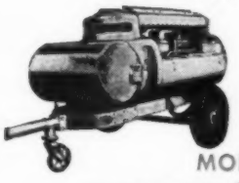

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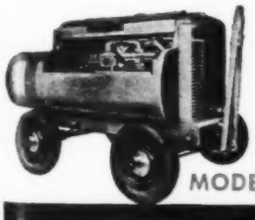

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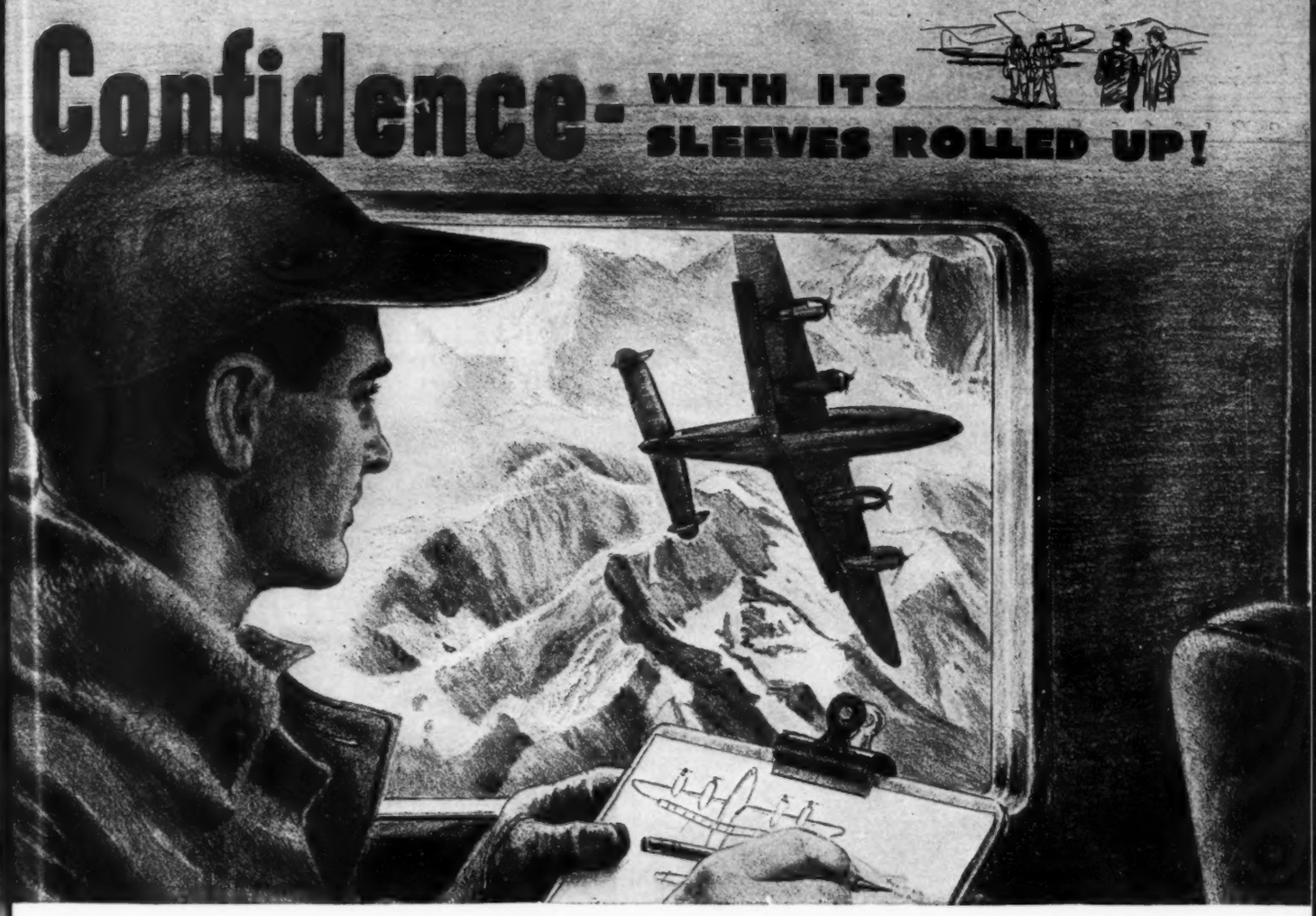

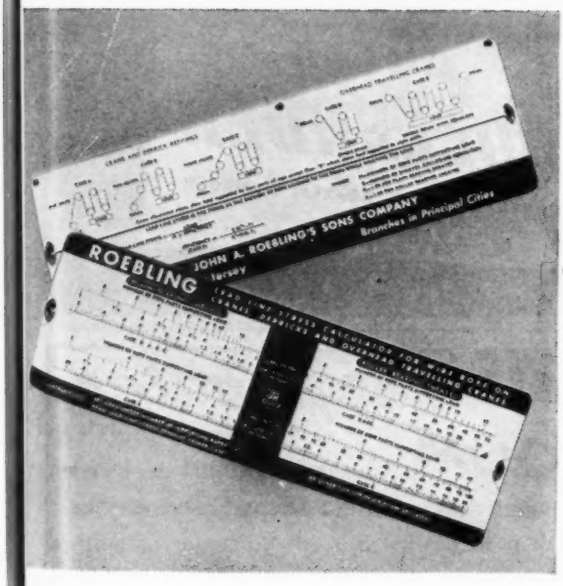

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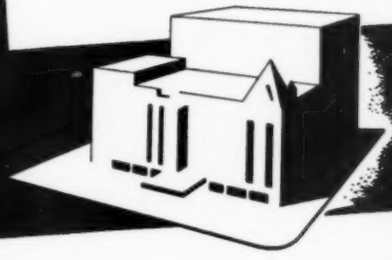

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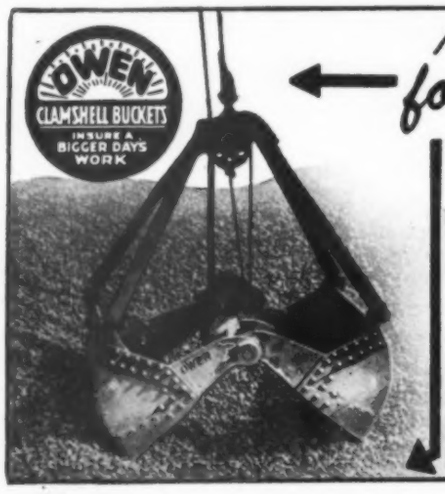

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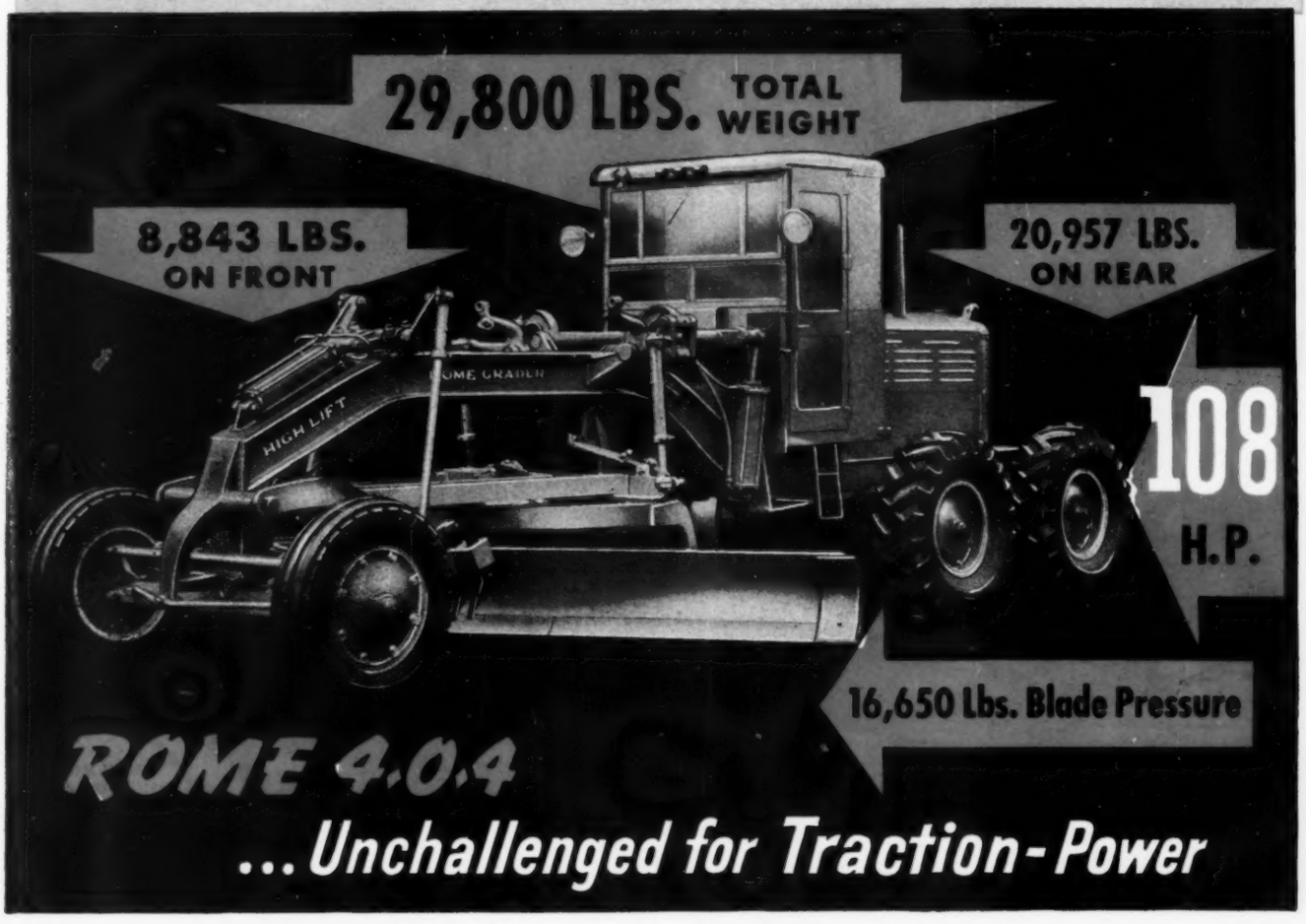

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ROADS AND STREETS

DECEMBER, 1948 • VOL. 91 • No. 12

NEW YORK CITY'S Expressway Program

A penetrating analysis, a bit of colorful reminiscence, and a review of past and present progress by world famous expressway planner. Fourth in a series of articles on expressway construction progress in American cities.—**Editor.**

By Robert Moses
City Construction Co-Ordinator,
City of New York

MUCH has been written in the past few years on arterial plans for urban centers, including volumes on population densities, land use, present and future traffic lane capacities, route selection, alignment, grades, traffic interchanges, acceleration and deceleration lanes, as well as many other problems confronting the modern road builder.

Many authors have approached the urban arterial problems with minds unfettered by the practical problems which beset the highway builder who has actually been responsible for construction in areas of high density population, where subways, elevated railroads, water aqueducts, telephone, electric, steam and gas lines always seem to be concentrated in the necessary right of way. Those who have not run the gauntlet can blithely advocate slashing super highways through the hearts of cities without regard for practical obstacles, local sentiment or cost.

Comparatively little has been printed on the many problems involved in the coordination of various agencies involved in urban highway work. This is due to the absence of a set formula or established practice, and to the fact that urban arterial work is still in its infancy. Few cities have completed substantial sections of their arterial highway system which include related improvements, such as housing, recreation, sewers, transportation, etc. In the New York metropolitan area we have a few years of experience behind us, not only in the design of these projects but also in their actual construction.

Bit-by-Bit Progress

I am by instinct and inheritance, as well as by experience, convinced that we make progress not by revolution, not by decentralization, not by abandoning what has been left us, however poor, unsatisfactory, ugly, dated or inadequate, but by reconstruction and revision, bit by bit, line upon line, stone upon stone, as we can get the support, the money, the men and the instruments to do it.

It cannot too often be repeated that all large improvements necessarily involve some compromises, but there is a limit to legitimate compromise, and that limit is reached when a program loses momentum, gets mired, stops, and can only be started again by superhuman effort. In a city like New York, with so many competing public and private enterprises, those which lose their precedence and priority may stay lost a long, long time, and sometimes are never revived. The average citizen has little notion of the difficulties in the way of large and expensive physical improvements in an established, thickly settled, obstinate democratic community where old, vested interests must be disturbed, sensitive feelings hurt, arthritic toes stepped on, pride of technical opinion outraged, and political and personal ambitions and shenanigans, masquerading as noble sentiments, outwitted or beaten down. If this were not so, why have so many of our most vitally needed changes and additions been so long delayed?

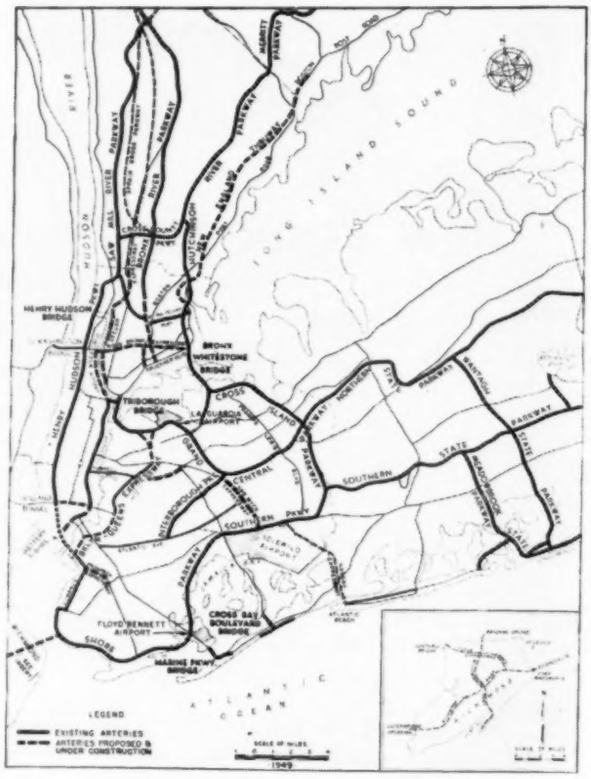
Robert Moses

As I have often said, three-fourths of the projects which we have picked up and pushed through in recent years were not our inventions. Others thought of them long ago, fought for public support, usually without success, got tired and quit or doggedly died in their tracks, passing their plans on to another generation.

Old "New" Projects

The idea of the Manhattan West Side Improvement was three quarters of a century old when we picked it up. Land for the Henry Hudson Bridge was acquired at the time of the Hudson-Fulton Celebration in 1906, about thirty years before we came along, financed, built it, and put Henry Hudson on top of his column at Spuyten Duyvil for the Bronx and the rest of the world to see. It was not easy to dislodge the squatters, yacht clubs, coal pockets, hospitals and homes along the Hudson, not to speak of an Indian princess at Inwood Park, and other miscellaneous opponents, who insisted that their continuance was more important than any road, park

★ Ramps and foundations for 6-lane elevated express viaduct, under construction on Brooklyn-Queens Expressway



★ New York metropolitan arteries—present and planned

or railroad improvement.

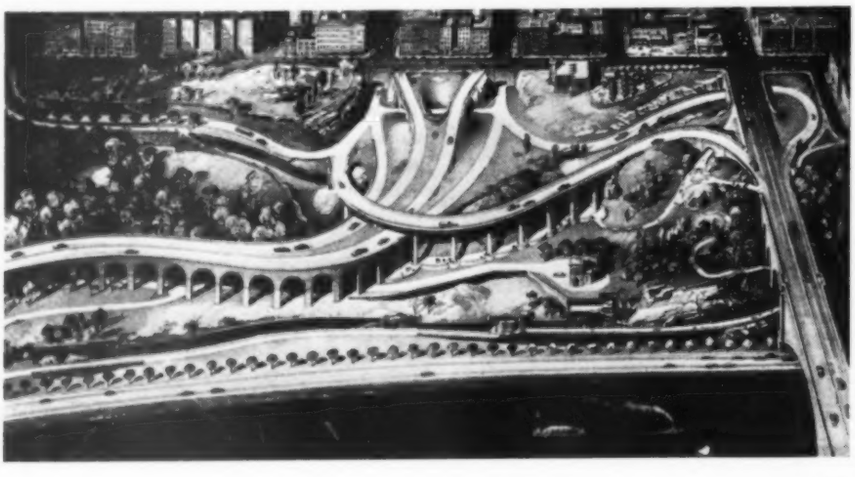
A plan for what is now Jones Beach was lying around in Nassau County for half a century when we decided to bring it to pass, and took on every kind of opposition, fishermen, old settlers, Albany stick-in-the-mud leaders of the twenties, real estate subdividers, and even the Great South Bay Ku Klux Klan, to acquire land and build.

300 Miles to Date

Arterial construction in the metropolitan area began three decades ago in Westchester County, which borders New York City on the north, and today there are 94 miles of parkways, including 109 grade separations, under the jurisdiction of the Westchester County Park Commission. The Long Island State Park Commission has jurisdiction over the parkway system east of New York City in Nassau and Suffolk Counties, aggregating 80 miles of completed parkways, including 111 grade separations. The system as developed in New York City comprises 82 miles of completed urban parkways, with 188 grade separations. In addition, a number of major river crossings have been constructed between the various boroughs, thus tying the entire system together.

The structures lying wholly within the City of New York were financed by the Triborough Bridge and Tunnel Authority or its predecessors by issuing revenue bonds supported by tolls paid by the users. This method of financing made construction possible many years earlier than if it had been dependent upon public funds. The arterial system also connects with the Interstate structures under the jurisdiction of the Port of New York Authority. These include the Holland and Lincoln Tunnels, George Washington Bridge, as well as three bridges connecting New Jersey with Staten Island.

Today, our parkway program is approaching completion. In the city, the great Belt swings around Brooklyn and Queens, opening meadow lands untouched since the days of the Canarsie and Rockaway Indians, connecting with the Whitestone and Triborough Bridges and the Brooklyn-Battery Tunnel now under construc-



★ One of the numerous complicated structures required in New York City's present expressway program is the Highbridge Interchange on the Cross-Bronx Expressway. Andrews & Clark and Hardesty & Hanover are designing engineers. DeBlasio and Son were low bidder recently for a small preliminary drainage and utility construction contract.

The preliminary work is to help clear the site for construction (by the Port of New York Authority) of a 2-lane vehicular tunnel approach to George Washington Bridge under West 179th St., paralleling the existing tunnel under West 178th. The new Cross-Bronx Expressway and the Harlem River Drive will intersect with the tunnel approaches to the bridge.

tion, to form with the Henry Hudson and Hutchinson River Parkways a ring around the entire city, green with landscaping by day and gold with sodium lights by night. The inner spokes of this giant wheel are fashioned out of the Grand Central and Interborough Parkways and the Queens Midtown Tunnel to Manhattan, and more spokes are to follow.

Current Progress

On Long Island, the State parkway program moves steadily eastward, with extensions of the Northern and Southern State Parkways totaling 20 miles rapidly nearing completion, and in Westchester designs are ready for a corresponding march to the north and east.

With the parkway system as a broad pattern, Federal, State and City plans for a comprehensive system of city expressways to serve mixed, as distinguished from restricted pleasure and passenger traffic, were pushed during the war years. When peace came, specifications were ready, complex design and right of way problems had been solved, and machinery established to insure cooperation and concentration of authority, and in the past three years construction contracts have been let one by one as reasonable bids could be obtained, people moved and sites cleared. Here is a brief description of some of the more important projects.

In **Manhattan** the East River or Franklin D. Roosevelt Drive, a restricted artery extending from the Battery to the Triborough Bridge, will have practically all traffic lights eliminated to provide for uninterrupted flow of traffic throughout its entire length. The City owns most of the land needed for the improvement and work in filling the gaps is proceeding section by section. Several new restricted elevated sections will be built which will allow freer use of the marginal street below for mixed traffic and for efficient traffic interchange between the Drive and Manhattan street system. This drive will serve the Brooklyn-Battery Tunnel, the Queens Midtown Tunnel and the Triborough Bridge, as well as the various free bridges.

The Harlem River Drive, an extension of the East River Drive northerly from the Triborough Bridge, will provide an express artery with marginal service facilities to the Harlem River Speedway which connects with the George Washington Bridge and the Henry Hudson Parkway. Work on bulkheading and filling is under way.

The Brooklyn-Battery Tunnel, on which work was stopped during the war, is again under construction under the more vigorous direction of the Triborough Bridge and Tunnel Authority, and will open in 1950. The southerly extension of the West Side or Miller Highway, now nearing completion, will run from its present terminus to the Manhattan Plaza of the tunnel. Construction on the tunnel under Battery Park, connecting the West Side Highway with the East River Drive, will proceed in the immediate future.

★ Also under construction in New York City—elevated viaduct for Franklin D. Roosevelt Drive. Gigantic Stuyvesant housing project seen in background

The Lower Manhattan Expressway, a largely elevated mixed-traffic route, will connect the Williamsburgh and the Manhattan bridges with the West Side Highway and the Holland Tunnel. Preliminary plans for this improvement are nearing completion.

In **Brooklyn** and **Queens**, widening of the Belt Parkway to its full capacity is under way and will provide a 6-lane express parkway extending practically from the Brooklyn-Battery Tunnel to the Bronx-Whitestone Bridge.

The Brooklyn-Queens Expressway is under construction, financed by a combination of Federal, State and City

★ Spectacular two- and three-level shelf construction was necessary for the Brooklyn-Queens Expressway, for which $18,000,000 in construction work is in progress. Watch for construction article in future issue of "Roads and Streets"

★ Storm sewer under construction at intersection of Van Wyck Expressway and Belt Parkway

★ These attractive homes had to be moved to make way for the Van Wyck Expressway

funds. Starting at the present end of the Gowanus Parkway, it runs north to connections with the Brooklyn, Manhattan and Williamsburgh bridges, and continues to a connection with the Grand Central Parkway east of the Triborough Bridge. Contracts totaling $18,000,000 now underway.

Other Major Projects

Van Wyck Expressway, another Federal-State-City project, will be a six-lane express artery for mixed traffic connecting the Queens Boulevard-Grand Central Parkway intersections with the Southern Parkway at Idlewild Airport on Jamaica Bay. Construction aggregating over $13,000,000 is under way, with the work spread throughout the greater portion of its length. The cost is shared equally by the State and Federal governments. Half the land cost is met by the City and half by the State.

The Queens Midtown Expressway is already completed from the Queens Midtown Tunnel to the Brooklyn-Queens Expressway. It is planned to continue it with City funds to Queens Boulevard.

Other major projects in Brooklyn and Queens include the Prospect Expressway, Atlantic Beach Bridge with a Nassau Expressway approach on the Nassau-Queens boundary line, and Conduit Boulevard where it is planned to start construction in the near future at the Cross Bay Boulevard intersection.

In the **Bronx**, Major Deegan Expressway, along the east bank of the Harlem River, will be built with State and Federal funds. Land has already been acquired with substantial City contributions for the first section and work will start soon. In addition, a contract has been advertised for the first stage of construction in Van Cortlandt Park. This expressway will run from the Triborough Bridge to Broadway at Van Cortlandt Park and Central Avenue at the Westchester County line.

★ Moving a 35-family brick and steel apartment building, one of many costly moving or demolition jobs for postwar expressways in New York City. The building was moved from one side of the expressway right-of-way to the other. Occupants remained in the building during preparations, but vacated for two days and nights during the actual moving as a safety precaution due to the presence of a large high-pressure gas main in the street.

The building was jacked up and brought to rest on a system of rollers, supported on eight pairs of rails as shown here. Four lines of block and tackle were employed in the move, two such 4-part lines being clevised to a double rope sling at either side of the building. Hand operated winches began the move, and truck operated winches aided in completion

Cross-Bronx Begun

The Cross-Bronx Expressway will connect the George Washington Bridge on the west with the Bronx-Whitestone Bridge on the east, intersecting all the main north-south routes. Work is now under way to clear the site and construction, financed by State and Federal funds, has begun. The cost of land, as usual, is shared by the City and State.

The New England Thruway will form a link in the New York to Boston route through New York City, Westchester County, Connecticut and Massachusetts. In Westchester it will parallel and relieve the old Boston Post Road. In the Bronx the cost of land as well as construction will be borne by the State and Federal people.

Other Bronx projects include the conversion of Bruckner Boulevard into a genuine expressway by eliminating important crossings, the completion of construction of the Bronx River Parkway southerly extension, and the new Bronx River Expressway-Boston Road artery, a Federal-State-City project which will reclaim and run along the lower Bronx River and will include the widening of Boston Road on the basis of expressway standards to the point where it joins the New England Thruway.

In **Staten Island**, the proposed Richmond Parkway will run to a new crossing of the Narrows between Forts Hamilton and Wadsworth, probably a 4600-ft. suspension span with a vertical clearance of about 237 ft.

"No Illusions"

Together, these projects in the five boroughs of the city form a unified network tying together the main arteries of the Greater City, Long Island, Westchester and New Jersey. Those of us who, in one capacity or another, have been working on this metropolitan arterial objective for almost a quarter of a century have never had any illusions from the beginning about the tremendous task before us. The need of these modern arteries of travel has become increasingly urgent as commerce and travel have more and more taken to the roads, as cars multiply and our entire civilization runs on wheels. To delay this program further would be an inexcusable civic and official blunder. We need only imagine the intolerable conditions which would exist today if our program had not been pushed forward vigorously in the last two decades, and if we reflect on the penalties we now face due to the interruption of construction during the war.

Today we are well on our way toward the solution of this problem in the metropolitan area, and I am happy to repeat previous acknowledgments of the aid of numerous agencies of government, Federal, State, City, County, Township, Village and Public Authority, who have generously and loyally cooperated continuously to bring about this pattern of democratic enterprise.

Throughways Designated by Oregon Board

Virtually all major highways in Oregon have been designated as a blanket action by the state highway commission to bring principal thoroughfares under the scope of the act before business enterprises encroach further on them.

Included in the list were the Pacific highway east and Pacific highway west, Columbia River highway, Old Oregon Trail, Central Oregon Highway, The Dallas-California highway, Oregon Coast highway, Santiam highway and many others.

The action was recommended by both state highway engineer R. H. Baldock and commission Counsel J. H. Devers, and was adopted unanimously by the commission. The highways will be posted with notice of their designation as throughways, as provided by law.

Excepted from the blanket ruling are sections where 10 business establishments per mile already are in operation. The action otherwise will prevent future establishment of businesses using the highway for direct access and will require them to provide access roads.

Gains on the Legislative Front

BY overwhelming adoption of a full anti-diversion amendment Nov. 2, Massachusetts became the 21st state prohibiting diversion of highway revenues to other purposes. Charles M. Upham, engineer-director of the American Road Builders' Association, in commenting on this event, said: "We are glad to welcome Massachusetts to the growing list of states having anti-diversion amendments. Approval of such legislation indicates that voters believe highway revenues should be used for highway purposes only."

Massachusetts' approval of such legislation is particularly welcomed by highway groups at this time because the amount of tax diversion appears to be on the increase. Tax diversion in 1947 was 80 per cent higher than in 1946, [totaling 170 million for the year]. "Perhaps the Massachusetts vote will tend to reverse this alarming trend," Mr. Upham pointed out.

He also called attention to constitutional amendments which were approved by West Virginia and Louisiana voters on Nov. 2 in the interest of good roads. This legislation is in the right direction, Mr. Upham said, because it means that more revenue in West Virginia and Louisiana will go for the improvement and maintenance of highways."

West Virginia voters ratified by a three-to-one majority a constitutional amendment providing for the issuance of $50,000,000 in bonds to build secondary roads. The State Road Commission of West Virginia estimates that 2,500 miles of secondary roads can be improved, and 3,000 miles of new roads can be constructed over a 5-year period with approval of the legislation.

Louisiana voters approved a constitutional amendment raising that part of the nine-cent gasoline tax earmarked for highway purposes from 5 up to 5½ cents.

Steal Steel from 30-ft. Bridge

Highway News, a publication of the Missouri Highway Commission reprints the following item from the *Kansas City Times:*

Nothing is safe nowadays, John Slattery, county highway engineer of Livingston County, complained to Sheriff Frank Jacobs.

Someone has stolen a bridge.

Slattery said a 30-ft. steel span was missing from a crossing 1½ miles north of Utica. The flooring was removed and thrown into the channel. A cutting torch was used with professional finesse to cut the bolts and the five I-beams and two channels were removed and hauled away.

The theft was of a bridge on a moderately used road, but no one saw it happen. However, persons in the area observed a strange truck, empty at the time, heading that way one evening, Slattery said.

Members of the Livingston County court believe the bridge steel, which is a hard-to-get item, probably was sold to a metropolis in this area after circuitous dodging over rural roads.

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"Traveling" Post Offices. The U.S. Post Office Department has been so satisfied with its "Travelling" highway post offices that it plans to have 70 in operation by 1950. At present 14 are operating.

EDITORIAL

★ "We Pay for Good Roads Whether We Have Them or Not"

It seems time to restate this fundamental fact, and use it as a stepping stone to bigger achievements.

As a slogan it lent courage to the good roads pioneers in the early days of the auto. It was true then. It is true today. During the coming year when legislatures will meet in nearly every state, there is timely need to prove it again.

Three or four decades back people were newly excited over the auto, and the need for roads and for ways of getting them stood out as a dramatic need indeed. More than a few politicians rode into office on a platform of road building. Anyone could see that it paid to "get out of the mud." Later this idea took a less colorful form. Engineers took up their slide rules and tried to prove that better highway surfaces paid for themselves in terms of saving in tires, gasoline, oil, and wear and tear on vehicles, and in saving of the motorist's time. This appeal, too, had some effect for a while, but got lost in the shuffle.

Worth More Today

Meanwhile, highway transportation came of age, multiplied ten and twenty fold. Today sensible investment in the upbuilding of a state's highways will pay greater economic and social returns than at any previous time in our history. [See Mr. Baldock's convention paper, in this issue.] This is so even at today's higher construction costs, because the stakes are so much higher. The fact that we are now a nation of 40 million motor vehicles, of which 7 million are trucks, writes a whole new ticket. To an astonishing degree every community is geared to motor transportation, far beyond the dreams of the most enthusiastic "good roads" crusaders of old.

Why is it, then, that road programs have had so many kicks in the teeth in more recent years? Road building never did come back after the depression to a pace that began to keep up with traffic wear and obsolescence. We were falling behind in 1941, the best year immediately before the war, and in 1948, with all the 1.7 billion road construction outlay, we built at only half the 1941 mileage rate. A four-billion annual pace will barely meet critical deficiencies, according to careful estimates.

The immediate reason for this lag is, of course, a money income reason. For a dozen or more years highway promotion has been in the hands of Casper Q. Milktoasts in most states. Organizations hostile to gas and vehicle tax raises won most of the battles. As a result, there have been only a few scattered gasoline tax raises. In 33 states the rate is unchanged since 1940, or before. The picture as to advances in license fees and other highway revenue sources is little better. Not a few states are having trouble matching federal-aid highway allotments.

From 1940 to 1948, while the national income and the cost of nearly everything more than doubled — including road construction and maintenance—the weighted average rate of gas taxation, for example, advanced only 14%. Highways, meantime, have evolved into broader, more streamlined creations, inherently more costly to build. This is no brief for any tax form, as such, but merely a look at the facts.

What of 1949?

Now it appears that history might repeat itself. The public is so aroused over congestion and accidents that political leaders are discovering, once again, that the good roads cause is indeed a popular one. In California, a highway crusade, new style, based on a brilliant and thorough engineering survey of highway, street and bridge deficiencies, resulted in a long-range revenue program large enough to meet most deficiencies and give this state possibly the finest highway system in the nation. Oregon, Washington and certain other states have followed suit in this new scientific approach. And in fifteen states, interim committees of the legislature or other groups representing the public have been busy studying the road problem, now grown so bewilderingly complex as well as serious.

Bigger Conception Needed

In these states, what next? In the other states, where no real step has been made to survey road needs and lay out a long-range tax program, who will emerge as leaders?

To be sure, some states made definite gains in 1948. Louisiana boosted its gas tax from 7 to 9 cents; $8,000,000 new revenue for roads. West Virginia voted 50 million in bonds for secondary roads. Kentucky passed a 2-cent gas tax boost for secondary and rural roads. Michigan's legislature advanced 5 million to counties for roads, though sidetracking the new tax legislation that was proposed after a state-wide study; this issue to be reviewed in 1949. Mississippi, which created a study committee, talks of a 1-cent boost to help amortize a 40-million bond issue. A 2-cent increase is planned in Pennsylvania.

Toll road action must also be included in the over-all financial picture. The Pennsylvania Turnpike's 75 million revenue bonds for the eastward extension is the year's biggest toll road news.

Highway engineering technology has come far. Now the spotlight must turn more and more to the fledgling art of analyzing highway need, devising answers, and making the facts public in terms everyone can understand. You know and I know that the citizens of your state are paying indirectly but dearly for lack of wider, safer, more direct, more congestion-free roads and streets. They are paying in little ways, such as in daily losses of valuable minutes and hours in congestion. They are paying in bigger ways, as when produce fails to get to market. They are paying in ways beyond price, in the form of unnecessary traffic deaths. But most important in this discussion, people are paying in tremendously big hidden ways for their lack of modern traffic facilities, in stifled community growth, retarded business, depressed property values, and unnecessarily high transportation costs for nearly everything we consume. The total loss is so tremendous that it jolts the imagination. But it must be measured, and proved.

Our real responsibility, however, is to be positive, not negative. We must fix our eyes not just on these losses but on potentials. Who could foresee the magic of the electric light? The telephone? The motor car? So it is with the magic of new highway transportation developments sure to come in the decades ahead.

The magic is there. Highway engineering's biggest and most challenging task is to prove it.

★ Highway Planning from the Air

From "The Highway," published by the New Jersey state highway department.

The late Dr. John Finley, former college president and editor of the New York Times, once observed that he thought that geography should be taught from an airplane to give students a "planetary view" of the universe. While our schools and colleges have not been prompt to follow his advice, engineers, scientists and explorers have long recognized that the airplane has not only given man wings but enabled him to extend the boundaries of man's knowledge.

For twenty years aerial photography has been used in connection with highway improvements. Such photogrammetric work has proved of great service in the planning, location, and design of new highways. While it is true roads must ultimately be built on the ground and ground surveys are essential to supplement aerial surveys, it cannot be gainsaid that aerial photography is an important new tool in the hands of the highway engineer in the layout of modern highways. In brief, such aerial photography has been used all the way from the plotting of alternative alignments to the preparation of soil maps.

In more recent years the planning of new highways from the air has become both a skill and an art. The ability to visualize in "planetary terms" the exact location of a projected new motorway; to study it with reference to other land use and probable traffic pattern can be most useful. It achieves what no model can produce. For such detailed planning the airplane or dirigible provide by far the best mechanics to visualize how new facilities would relieve traffic congestion.

In New Jersey the State Highway Department has begun the use of such aerial investigation for highway planning. A series of such flights worked out in cooperation with the U. S. Navy have already commenced and will be continued in connection with routine training flights. Various members of the Planning Division will be enabled to inspect the highway system and study their plans and general locations in the light of these aerial views. This can be done carefully and objectively without unseemly haste. Subsequently it is hoped that draftsmen and designing engineers can undertake similar aerial trips.

We stand on the threshold of a new day in the development of highway planning even as we embark on the development of a new system of functional motorways, controlled access Parkways and Freeways. Thus does the progress of one scientific advance aid another engineering step forward. Together it reflects the genius of America and our capacity for willing cooperation which is the very condition of that genius.—*Spencer Miller, Jr., State Highway Commissioner.*

★ Workmanship Still Big Question

The art of paving with concrete has come a long way, and old timers would rub their eyes were they to come back to life and visit a modern concrete road job and see all the fancy equipment at work. They would see some mighty fine concrete being placed, as far as design and control of the mix are concerned, although some cities and other agencies still allow "sloppy mix." They would see big days' runs. They would see a good job of finishing, by and large.

But if the project is a typical job, they would see a surprising laxity in some of the details from there on. Only recently, for example, have we come to realize that liquid curing materials must be applied under positive control. Slip-ups are still seen here.

And, the dowel or tie bar or joint assembly that is placed and held in precise position during the concreting, is still the exception in some places. As the years pass, it becomes more and more clear that accurately constructed joints are of vital importance to pavement durability. We're indebted to an unnamed engineer friend for reminding us that here is a place where good field supervision pays off with extra dividends.

★ Congratulations

. . . to Ray F. Smock, Pennsylvania's secretary of highways, and staff, for the remarkably readable and impressive presentation, "Pennsylvania's State Highways—Greatest Transportation System in the World—How Can We Keep It That Way?" One of the best efforts yet in picturing complex highway needs in terms that the public can understand. . . . by a state that is already spending one hundred million dollars a year for roads, but needs more funds and is putting the problem squarely up to its citizens.

. . . to the American Public Works Association which met last month in Boston, for a fine convention and for a record-breaking year in attracting new members. Every city engineer and public works official ought to belong.

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Relighting Program for Long Island Town—Brookhaven, Suffolk County, Long Island (N.Y.) has already completed a part of a long range street lighting modernization plan. To date, 31 obsolete, 1,000-lumen lamps have been replaced by modern 6,000-lumen units in the street lighting districts of Blue Point, East Patchogue, and Eastport.

Roads and Streets Editorial Policies

- *Sound financing of highway programs, based on economic needs, benefits to be conferred, and ability to pay.*
- *Improved maintenance of surfaces, shoulders and bridges in the many districts where maintenance has been inadequate.*
- *Continuance of motor fuel taxes, as the most equitable means of assessing highway use, or benefits; but with greater uniformity of tax rates among the states, and without making such rates excessive or oppressive.*
- *Continuation of federal aid for state and county highways and for through streets in cities and towns.*
- *Engineering supervision and administration of all road and street systems, and the elimination of these activities from politics insofar as may be possible.*
- *Construction by contract rather than by day labor.*
- ***Unalterable opposition to the diversion of fuel taxes and auto license fees to non-highway uses.***

Soil-Cement Floor for Aggregate Stockpiles

VERY large yardages of road materials had to be stockpiled on a 7-mile road paving job in Crawford County, Pennsylvania, in order to expedite work. Faced with spotting this material on soft ground through a winter and spring, the contractors, J. F. Bloomer Co., of Appleton, Wis., studied various ways to floor the stockpile area. In place of planking, which might make trouble in cleaning up the last few inches of material, the contractor decided to try soil-cement.

Because of the temporary nature of the paving wanted, the customary procedures were modified. A soils analysis was made, resulting in an 8% cement factor being selected for full depth and an additional 4% in the top 2 in. This rich mix was used in view of the highly organic soil.

The stockpile area of 84 x 333 ft. was leveled and soil-cement processing carried out in 8-ft. lanes, as with an airport apron job. Simplest available equipment was used, consisting of two spring-tooth harrows, a farm tractor, double drum-sheepsfoot roller, motor grader, circular lime spreader, 3-wheel roller, 1200-gal. water truck, and two pick-up trucks serving as final pneumatic rollers.

Control factors, such as moisture percentages, cement content, density, etc., were based on previous experience with similar soils. The 3,100 sq. yd. of base was completed at a cost of less than $2,500.

New York Trainee Program

Fifty-four veterans of World War II have successfully completed a year of In-Service training as Junior Engineering Aides in the New York State Department of Public Works and are now assigned to various district offices of the department.

Graduates of the Department's training program for veterans now have provisional appointments as Junior Engineering Aides at $2070 annually and are qualified for permanent appointment to their positions through regular civil service procedures. During the training period, veterans were paid at the rate of $1800 annually. Of this, $240 was paid by the federal government under the terms of the G. I. Bill of Rights.

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Virginia to Move Road Research Section. The Virginia Department of Highways early next year will move its research section from Richmond to Charlottesville where the offices and laboratories will be associated with the department of engineering at the University of Virginia to become the Virginia Council of Highway Investigation and Research. The new council will be administered by a board composed of C. S. Mullen, chief engineer for the department of highways, as chairman; Edward W. Saunders, University dean of engineering; and T. E. Shelburne, director of research for the department of highways.

★ Light trucks being used as pneumatic rollers

★ Completed base, divided into three sections for sand and two sizes of aggregate. Note location of area adjacent to rail siding and aggregate bins

★ (Left): Dry mixing being completed on two 8-ft. lanes, cement being spread on third lane. Straw curing cover for completed lanes seen at left. (Right): Sprinkler truck included a job-made spray bar. Spring-tooth harrow in foreground performing mixing

A Look at Our Bigger Problems

AASHO's retiring president reviews the serious lag in postwar roadbuilding and makes recommendations which should be read by all officials, engineers, contractors, legislators, editors and leading citizens concerned with highway transportation

Address before Annual Meeting, American Association of State Highway Officials, Salt Lake City, Sept. 20, 1948.

By R. H. Baldock

State Highway Engineer of Oregon

THE work of this Association represents a truly democratic process in a nation of free men. It serves as a model of proper relations between the Federal Government and the several states. The representatives of the state impose rules and regulations upon the membership which are enforced by the Federal Agency. We, in fact, write our own specifications with relation to design and technical procedure and likewise promulgate many of the administrative directives exercised.

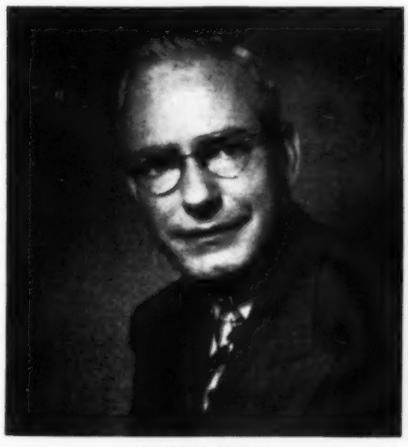
Moreover, the membership contacts the Congress and provides the factual data upon which federal road legislation is based. **Through many years of fair dealing and straight thinking, the members of the Congress have come to regard this Association most highly. We seek no personal gain; we are activated solely in the creation of benefits for the greatest number of people.***

Since we are met here in the West, you will pardon me if I shoot straight from the shoulder. I have spoken of our virtues; I shall presently speak of our faults.

Let's Examine Ourselves

Every individual should examine himself now and then, frankly and honestly; place himself over in the corner, so to speak, and criticise the faults that he finds. None of us is perfect and each of us will find defects in his own conduct as measured by the principles of right living and good citizenship for which we should all strive. We cannot fool ourselves even though we may at least think we are successful in fooling others.

This nation needs highways and needs them badly—not so much the opening up of new highways as the reconstruction of old, obsolete, worn-out highways that are subject to extremely heavy traffic and that are causing material congestion, delay, and positive hazard to life and property. Failure to do this work is retarding the expansion of the economy of the entire nation.



R. H. Baldock

We are, in fact, a nation upon wheels. Highways affect the lives of all people. Everything we eat, wear, or use is transported, in part at least, over the rural roads or city streets. This is likewise true of services. **Ironically, in many cases, the annual monetary benefits to the motoring public that would result from the proper improvement of our main traffic arterials is from *two to five times the annual cost of the desired improvements.* Thus the people are paying over and over again for better roads that they never enjoy.**

In 1943 a bill was introduced in the Congress for authorization of one billion dollars per year as federal aid for highways. This was finally reduced to $500,000,000 per year. Surveys conducted in 1943 indicated that an expenditure of not less than two billion dollars per year on the nation's highways was needed to care for critical road deficiencies.

In 1947 another recapitulation was made of the average annual capital outlay requirements to effect improvements needed as of December 31, 1947, and additional needs accruing on the primary, secondary and urban federal-aid systems. During the next five years, by reason of neglected restoration of depreciated facilities, there would be required an annual outlay of four billion dollars; for a 10-year period, there would be required an annual outlay of two and one-half billion dollars; for a 15-year period, an annual outlay of two billion dollars, which checks the 1943 forecast. Needless to say, we are falling far short of these objectives.

The 1944 Road Act called for one-half billion dollars per year of federal funds to be matched by a like amount of state funds, representing a proposed expenditure of about one billion dollars per year upon the federal-aid systems or one-fourth of the amount that we now find is needed to rehabilitate them. Let's see what the record has been in the expenditure of these funds.

Traces Lagging Pace

For the country as a whole, the data show that as of July 1, 1948, the federal funds earned by work done amounted to only 34% of the total available apportionments. An additional 18% of the funds apportioned were under contract but not earned, making a total of 52% under contract. A total of 87% of the apportionments had been programmed.

In the western states, generally better progress has been made in utilizing postwar funds than in the country as a whole. In nearly half of the 48 states and two territories, federal funds available from the three-year program which were earned by work done to July 1, 1948, amounted to less than the apportionment for one fiscal year. In eight states and two territories, the corresponding figure is 20%; in four of the states and two territories, less than 15% of a single year's apportionment of the apportioned funds and the total federal funds under contract. This is truly a sorry showing.

*Italics and bold face type throughout this paper are ours—Editor.

Let us recall that the 1944 Road Act became operative in October, 1945, the first postwar fiscal year ending June 30, 1946, the second year ending June 30, 1947, and the third year ending June 30, 1948. Last year Congress extended the time of taking up the federal funds one year; the 1948 Road Act extended it another year and, unless the states make better progress, **I would not be at all surprised that it would have to be extended the third year to prevent certain of the states from losing federal funds. Personally, I would not be in favor of this. If any state cannot so conduct its affairs as to accomplish a three-year program in five years, it deserves to lose the money and should not object to its allocation among states which can spend it.**

This year, at the eleventh hour, so to speak, the 1948 Road Act finally passed the Congress just before adjournment. Your President, the Executive Secretary and the members of your Executive Committee labored long and hard to convince the Congressional Committee of the need of this legislation. We asked for $500,000,000 on a continuing basis until repealed or amended and a bill to that effect was introduced in the House. The bill in the Senate reduced the authorization to $300,000,000 per year and the time to two years.

Congress Was Hesitant

Thos. H. MacDonald, Commissioner of Public Roads, was called upon to make a showing of the progress of the expenditure of the fund under the 1944 Road Act. The showing was not too impressive because it represented the truth. We explained that the shortage of men and materials and the necessity for reorganizing the departments following the war had slowed down the procedure and handicapped the effort. We called attention to the better progress now being made and promised that the states would exercise the due diligence required to do this very necessary work upon the nation's highways provided the Congress would make available not less than $500,000,000 a year.

Finally, in compromise, and just before the Congress adjourned, the conferees of the Senate and the House agreed upon an authorization of $450,000,000 for two years. **Under the circumstances, and based upon the record, I believe this was a major victory, but let me warn you that, unless the states are able to make materially better progress in the next two years, it is my opinion that we will not be able to get another authorization of funds two years hence.**

Everyone agrees that we should have better roads—there is no argument upon that score—but the money must be spent in a diligent, forthright and economical manner or we as highway officials will be remiss in our important duties and the public will be denied the facilities which it needs and desires to make possible a safe and efficient highway system. We must immediately put our house in order and show by our deeds and not by our words only that we can meet this challenge. We cannot let grass grow under our feet; we must do it now.

Ferret Weak Spots

In the carrying out of this vast program of building the nation's highways, there are infinite details that must be attended to. There is always some weakness in procedure, some feature of detail that is holding up the work; that is preventing the contracting of projects. In one department it may be one feature and, in another, another feature. It is necessary to make the surveys, to complete the right-of-way descriptions, to procure the right-of-way, and to prepare the plans, specifications and contract proposals. I would suggest that we look over every feature of that work, arrange a schedule of lettings, and get a monthly report on the progress of every item of the detail required, to see where the bottleneck is and, when the bottlenecks are found, do something about them. Take positive action to expedite this or that part of the program that is dilatory. After the contracts are let, put pressure on the contractors to proceed. Invoke penalties for nonperformance. If we do these things, we will find that we can do the job properly and I believe there will be so much demand by the American people for better roads that the Congress will make the funds available to properly reconstruct the nation's highways in a reasonable period of time. By the same token, the people of the states will, if necessary, augment the road income of each state to accomplish this purpose. After all, we cannot depend upon the Federal Government for everything, or we will lose the autonomy of the states and with it the American system of government.

Sees No Cost Drop

It would seem that the dollar has been permanently devaluated. It will take more dollars—about twice as many—to build the same roads now as before the war. People are earning more dollars and the economy must be placed in balance by the levying of more taxes to do the things that the public requires in order to carry on our civilization—the American way of life. **Now, if we are able to make the showing which I hope that we can and which we should do, we will promote the whole economy of the United States by decreasing the cost of transportation of goods and services. In that event, I believe that we can ask and will receive from the Congress two years hence a bill authorizing one billion dollars of federal aid for highways, but unless we can make a better showing than we have in the past, there is little likelihood that such authorization will be made until we have spent the funds now available to us.**

The problem of the shortage of engineers is quite serious. General J. A. Anderson, Commissioner of Highways of Virginia and a member of the AASHO's Executive Committee, has very ably presented the problem.* A questionnaire to all universities shows that, of the 21,000 engineering graduates in 1948, little more than 3,000 would be graduated in civil engineering, of whom only 600 pro-

*April, 1948, American Highways

Mr. Baldock's Recommendations

AASHO Should Consider

1. The immediate need to expedite the contracting of highway projects, and the organization of the state highway departments, to handle not less than $2 billion worth of federal-aid highway work annually.
2. The promotion of a completed study of road and street needs of each state, and of an adequate highway-taxation plan to meet such needs in a reasonable time and with relation to benefits received.
3. A survey of state systems and the deletion of unimportant local roads so as to apply more funds to expedite the building of the heavily traveled main highways.
4. The increase of salaries in the highway departments and the formulation of plans to interest colleges, universities and students in the training of highway engineers.
5. A selling job to the members of the highway industry to show each of them the monetary benefits possible by materially increasing road and street expenditures to meet the challenge of motor-transportation problems of the nation.
6. The expansion of the activities of the Association and the need for increasing membership dues to meet the increased cost.

fessed any interest in highway engineering. General Anderson recommends a better salary scale, a sound personnel policy affording the opportunity for more rapid advancement, the necessity for keeping in constant touch with colleges and universities and of selling the students on highway engineering as a profession. It appears that, at this particular time, the rapid promotion of young graduates would be certain because most of the highway personnel in the several states was recruited a quarter century or more ago, and the average age of highway engineers is in the 45- to 60-year age bracket.

The highway transportation industry is one of the largest in the nation. It has many ramifications. About one person out of every seven is employed by the industry. It would appear necessary for the AASHO to do a selling job with each group within the industry to show them the real benefits of an expanded highway program. Each group should be directly interested in an expanded highway program which will not only be in the public interest but likewise directly benefit the group. **There is a tendency for certain individuals and groups to talk about the public interest and at the same time formulate schemes to prevent increases in public revenue and thereby seriously curtail needed public improvement.**

Our Highway "Enemies"

Power] pressure on state legislatures and the Congress, actuated by self-interest, subtle propaganda, sharp-shooting against programs adopted for highway construction and financing, the employment of theories to circumvent practical application of basic problems, and a myriad of other activities fostered and promoted by inherently selfish elements in allied groups should not prevail. Frank discussions with such groups should be encouraged in the belief that, when the over-all picture is fully understood, much of this opposition will vanish.

It appears axiomatic that the beneficiaries of roads and streets should support the roads. The beneficiaries are, in the main, three in number: the general public, the property owner, and the road user. The general public benefits regardless of ownership of either land or motor vehicle. Roads and streets bring them mail service, express service, freight service, bus service, fire and police protection, the daily newspaper, milk delivery, and many other benefits. The property owner is unquestionably benefited by roads. The farm is of little value without access to good roads. Each homeowner desires a paved street in front of his property. Property benefits materially even by the construction of freeways wherein access is limited at certain intervals by traffic interchanges. Such freeways make possible rapid transportation between outlying residential districts and the city.

The general public pays practically nothing for roads and streets, and the burden on the property owner has been constantly lightened until almost the whole burden has been thrown on the road user. This is a grave defect in most of our taxation systems and should be corrected.

More $$ For Arterials

State revenues for roads are derived from taxation of the road user. The unwise addition to the state systems of so many secondary or feeder roads has placed such a burden upon highway finances that there will be insufficient funds to properly care for the main highways which carry the bulk of the traffic. In some states this situation already exists.

Failure to restore depreciation on main highways from both structural deterioration and functional obsolescence is causing an increasing inconvenience, congestion and expense in operation, while the hazards to motor-vehicle operation, involving property damage, personal injury and death from motor accidents, are increasing at an alarming rate. First things must come first. Traffic must first be kept moving at reasonable speeds with safety on the arterial highways which carry the lifeblood of the nation's commerce before systems are expanded to include too great a number of feeder roads.

A study of the annual earnings, benefits, costs and depreciation of each highway and of the highway systems is recommended to clarify this subject. A highway department is truly big business, and a searching analysis of the basic fiscal principles involved is necessary in order to preserve system solvencies and to gain the maximum monetary benefits for those who pay for the roads. We should apply the same measuring sticks which have made free enterprise in America so successful.

Charge Trucks, Buses More

It is evident that the greatest benefit received from roads and streets is by the users of such facilities, the owners of motor vehicles. **In setting up taxation for the road-user's share of road and street costs, it is my opinion that the heavy vehicles, trucks and buses, are not paying their fair share.**

It is certain that the pavement must be thicker and wider and the bridges stronger and wider to support the greater weights and provide room for the larger dimensions. Such construction and the maintenance that follows cost more money.

The postwar road dollar is worth about one-half of the prewar road dollar, and gradually adjustments are being made in wages and salaries accordingly. It will be necessary to consider the impact of the deflated dollar upon all forms of taxation to support the governmental functions if our present civilization is to be carried on. This is likewise true of the road builder. We must have twice as many dollars in the form of taxation as before if we are to do the things the public demands. Likewise, we must have twice as much federal aid. These things are necessary to secure an economic balance and to provide the roads the public now requires.

Studies of highway needs and highway taxation have recently been conducted in several of the states by interim committees of the legislatures. Such a study is now under way in Oregon. Happily, the committee engaged the services of the Automotive Safety Foundation and this portion of the report has now been completed. The Automotive Safety Foundation has, in this and in other states, done a remarkably fine job in the determination of highway needs and this organization is to be commended for its fine leadership.

Likewise, the Highway Research Board has done an outstanding job in the study of highway organization in Colorado.

Toll Road Question

The phenomenal growth of traffic, particularly in and around the urban areas, has resulted in a marked demand for an expressway type of construction. The shortage of federal and state funds for road building and the tremendous demand by groups of people everywhere for their alleged share of available funds to modernize highways have resulted in the promotion of a number of miles of toll roads in various parts of the country.

There are two schools of thought, one being that the imposition of tolls —a procedure generally used and abandoned years ago—is an obsolete method of financing and, in fact, now constitutes double taxation. Other groups claim that, be that as it may, it appears impossible to secure sufficient state and federal funds to allocate the great sums required for the specific projects in question because of the opposition of groups in other portions of the state. It is said that this opposition does not materialize if projects are financed through the

(*Continued on page* 63)

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Public Works Expansion

By Halbert P. Gillette

IN the *Monthly Labor Review* there is given, each month, an estimate of "expenditure for new construction (work put in place)," under two broad classes and numerous subclasses. The two broad classes are (1) Private Construction and (2) Public Construction. Under the latter there are 12 subclasses, of which three, (1) Highways, (2) Sewer and Water, and (3) Conservation and Development, are of most interest to civil engineers and contractors. The following table gives the totals for each of these 3 subclasses for the years 1946, 1947 and the first 9 months of 1948.

	1946 12 months	1947 12 months	1948 9 months
Highways	$ 772,000,000	$1,233,000,000	$1,129,000,000
*Sewer and Water	194,000,000	331,000,000	327,000,000
Conservation and Development	240,000,000	396,000,000	590,000,000
Total	$1,206,000,000	$1,960,000,000	$2,046,000,000

*Specifically category includes the construction of dams, locks, reservoirs, levees, revetments, channels, canals, drainage ditches, pump houses, transmission lines, piers, etc., including appurtenant structures and essential community facilities.

It should be noted that for the first 9 months of 1948 the total exceeds that for the entire year of 1947, and is 70% greater than for the entire year of 1946. During the last 3 months of 1947 the expenditures for Highways were $240,000,000, or about 24% of that for the first 9 months of 1947. So if 24% of $1,129,000,000 be added thereto, it will make the probable total for 1948 more than $1,410,000,000, or nearly double that in 1946, and about 25% above 1947.

The expenditure for Water and Sewage Works in the last three months of 1947 was $95,000,000, or about 40% of that in the first 9 months. If 40% be added to the $327,000,000 spent in the first 9 months of 1948, the total for the year will be about $458,000,000. A similar estimate for Conservation and Development Works shows that about 40% may be added to the $590,000,000 during the last 3 months of 1948, bringing the year's total up to $825,000,000. Hence, these three classes of civil engineering works probably will total about $2,700,000,000 in 1948, or well over double that in 1946.

Because of the great backlog of needed civil engineering works, resulting from 4½ years of warfare, it is probable that in 1949 there will be an increased expenditure of fully 30% over that of 1948 for such construction, exclusive of maintenance.

Training Program for Highway Employees

Plans for a training program for Oklahoma state highway department employees have been completed by State Highway Director H. E. Bailey.

A series of 2-week courses have been arranged at the engineering school of Oklahoma A&M college for more than 100 department personnel.

First courses will be in soil mechanics for 70 inspectors, field men, laboratory technicians, resident and design engineers.

Following will come courses in asphalt paving preparation and concrete inspection to be attended by inspectors, field men and engineers.

●

29,608,318 People Visit National Parks. According to a report of the National Park Service, its 176 parks, monuments and historical sites attracted 29,608,318 visitors in 1948. This is 17% over last year. The travel represented was 95% over highways.

(*Continued from page* 61)

sale of revenue bonds amortized by the collection of tolls and that the people who need the improved facilities so badly are more than willing to pay the additional charge in order to realize the benefits now rather than wait for them in the indefinite future.

There is little question of the success of toll bridges provided they are constructed in a location that serves major traffic volumes. In general, there is no duplicate or competing facility and all traffic must pay tolls. In contrast to this, in general where there is a duplicating free road facility so that, unless conditions are exceptional in character and the benefits of the toll facility are quite material, the toll road will not capture all of the traffic. It is, moveover, difficult to serve all of the available traffic under the toll-road plan because of the expense of providing traffic interchanges and the necessity for additional toll collectors. The cost of toll collection, policing and other operational features, in addition to maintenance of toll roads and the amortization of the capital investment, is quite material. Moreover, there is a tendency for promoters of toll roads to augment the possible traffic with resulting revenues beyond any reasonable expectation, so that there is the danger of toll facilities not being able to pay for operation and amortization of the investment, with the resulting demand that the public, through the state highway departments, assume the obligation. This has proven true in many cases of toll bridges which were found to be unsuccessful financial ventures.

Therefore, in general, it would seem that toll roads represent an additional charge against the road user, either directly or indirectly, and that their promotion should be discouraged. Certainly their use should be a major exception and not the rule. It would seem better to obtain more dollars to expedite the building of free roads. I recommend that the Association oppose the construction of toll roads on the federal-aid system and reaffirm the wisdom of the provision of federal highway legislation establishing the principle of freedom from tolls.

Traffic Code Group Causing Embarrassment

The Association's recommendations relative to the adoption as a section of the uniform vehicle code of proposed regulations of the size and weight of vehicles have been supported by the American Association of Motor Vehicle Administrators and by

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the International Association of Chiefs of Police. The adoption and promulgation by the National Committee on Uniform Traffic Laws and Ordinances of a provision differing essentially from the recommendations supported by the several groups of officials above named, cannot fail to embarrass efforts to achieve the uniformity of state legislation in this respect which is the avowed objective of all proposals.

The Association is well represented by its capable and efficient Executive Secretary, Hal H. Hale. The secretary of AASHO should visit every state at least every two years, sit down and talk over with the chief administrative official and his assistants the many problems of the Association, the Congressional problems in Washington, the relations of the highway departments with the PRA. He should also have time to contact the many associations and groups of allied industries to explain to them the problems of the several states and the PRA in the building of the nation's highways. To that end, in my opinion, he should have an augmented staff in Washington to enable him to be away on the very important missions I have outlined.

We also need to broaden the scope of the Association's publications so as to better inform the public of the aims and objectives of the Association and the public-spirited nature of its objectives.

On Loyalty

If you work for a man, in heaven's name, work for him. If he pays wages that supply you and yours bread and butter, work for him, speak well of him, think well of him, stand by him, and stand by the institution he represents. I think if I worked for a man I would not work for him a part of his time, but all of his time.

I would give undivided service or none. If put to a pinch, an ounce of loyalty is worth a pound of cleverness. If you must vilify, condemn and eternally disparage, why, resign your position, and when you are outside, damn to your heart's content.

But, I pray you, so long as you are a part of an institution, do not condemn it. Not that you will injure the institution, not that, but when you disparage the concern of which you are a part, you disparage yourself.

—Elbert Hubbard

Sawing Concrete Sidewalks

By William J. Chadwick
City Engineer, Racine, Wisconsin

EXISTING sidewalk widths had to be decreased when Racine, Wisconsin, widened and repaved its North Main Street. Originally, each of the two 15-ft. parkways included an 8-ft. sidewalk. Roadway widening reduced the parkway width to 12 ft. and necessitated the removal of nearly all trees. To provide a 6-ft. space for new tree-planting, owners of abutting property requested that the sidewalk width be reduced to 6 ft. The City Council approved this change and adopted an ordinance providing for the new width.

Because most of the walk was old two-course construction, it was first thought wiser to remove the old slab rather than to attempt any kind of cutting operation. Nevertheless, a survey was made to determine the condition of the walks which had not been damaged during construction or removed because of grade changes. This survey revealed that more than half of the total walk remaining on the street was in very good condition. Some had been built within two or three years. It was estimated that removal and disposal of an existing walk plus construction of a new one-course walk would cost about $2.50 per lin. ft. Hence, the removal of about 3,000 ft. of perfectly satisfactory existing walk would cost $7,500. In addition, there would be a similar cost for removal of unsatisfactory walkways.

Salvaging all walks in good condition was concluded to be the most economical procedure. A power-operated push-cart-type "Concut Jr." saw was rented to cut the walkway to the desired width. This machine has a circular blade driven by a gasoline motor mounted on a four-wheeled frame. The machine is pushed and guided by the operator. The circular blade is cooled by a jet of water and can be readily adjusted vertically to control the depth of the cut. Operation was relatively simple and results obtained were far beyond expectations. The new edge is straight and clean in all types of sidewalk.

The Cutting Operation

Location of the cut was accurately marked by chalk line and easily followed by the saw operator. The cut extended only part way through the walk. The excess walkway slab was then removed by shoveling away its earth support, breaking up with sledge-hammers and hand-loading in light dump trucks.

The crew, taken from regular street maintenance crews, consisted of two operators, one or two laborers and a truck driver. The only equipment was a light dump truck, hand tools and the power saw. The large amount of vibration transmitted by the cutting machine made the use of two operators desirable. Exchanging duties every half hour, each of the two operators worked as a laborer while not running the cutting machine.

The most suitable depth of cut was determined by experiment. The first cuts were only 1 in. deep. This depth was not enough to assure a uniform break. The depth of cut was increased to 1½ in. and then to 2 in. before the best results were obtained. It was also found that the best production was obtained by keeping the blade continuously engaged. Overloading the saw resulted only in a stalled motor.

The cutting speed was from 2 to 2½ ft. per minute with higher speeds in some walks. A usual day's work was from 600 to 700 lin. ft. of walk cut. The work was not always continuous. Frequently there would be 50 to 100 ft. of cutting followed by a 40-ft. gap and then another 75 or 80 ft. of cutting followed by a gap. All equipment was removed from the street every night and returned again in the morning.

Cost records were kept and reduced to cost per lin. ft. of 1-in. deep cut. This unit cost, which includes all but backfilling, was $0.1885. The contractor backfilled without further direct cost to the city by doing the street work at the same time he regraded the rest of the area between walk and curb.

All walks cut were plain concrete. No experience was obtained where reinforcing of any kind existed. However, in view of the results obtained, the City of Racine expects to make further use of this type of concrete-cutting equipment. Since it provides a straight square edge similar to that of a construction joint, this equipment should be very helpful in trimming service openings in concrete pavements before patching, or even in making the original cuts.

●

Publications National Bureau of Standards. Circular 460—375 pages, listing all publications of the National Bureau of Standards from 1901 to June 30, 1947, is now available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., at a cost of 75c per copy.

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WHEN THE WINTER BLITZ STRUCK NEW YORK

December 26, 1947 . . . and again January 2, 1948

FWDs were the spearhead of the snow-clearing front

No Christmas present was the record-breaking 25.8 inches of snow that paralyzed the nation's largest city, December 26, 1947. No more welcome was the sleet storm that followed just one week later. Certainly, no greater snow-fighting job ever had to be done.

Spearheading this fight were fleets of powerful, dependable FWD four-wheel-drive trucks. Some units actually had been commandeered from dealers' display rooms and hastily equipped with snowplows.

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AGAIN THIS WINTER . . . MORE FWDs WILL BE MOVING MORE SNOW

★ Huge cut at the left provided material for the counterforted fill at the right, as seen on the Clyde Wood US 99 contract. This scene shows early stage of work, with overhead conveyor set up just left of the cut, for delivering material across the highway without disturbing traffic. This method gave way to regular scraper hauling as the job progressed, as a means of faster production

California's "Heaviest Road Job"

II—The Clyde Wood Contract

Concluding a pictorial review of the heavy widening and realignment in progress during past two years north of Los Angeles on U.S. 99 California

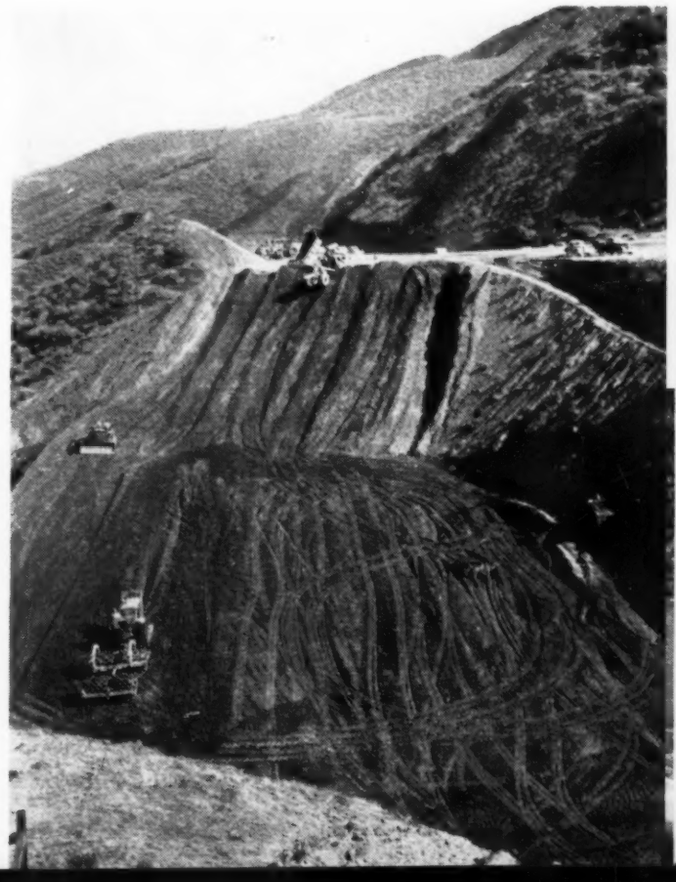
OVER 3,250,000 cubic yards of earth and rock excavation was required in widening and realigning an 11-mile section of U.S. 99 between Castaic and Gorman Station, Calif., where this road starts up the long "Ridge" grade, some fifty miles out of Los Angeles toward Bakersfield.

ROADS AND STREETS in June '48 presented an account of the 8.2-mile section built by Winston Bros. Company.

On these pages are glimpses of the equally interesting and difficult 2.6-mile section completed by Clyde Wood Construction Company of North Hollywood, Calif., with Southwest Paving Co. subcontracting the hot-mix surfacing. The Wood project, comprising grading and paving, was let in March, 1947. As with the Winston work, the Wood section involved tremendous sidehill cuts and fills, required to widen the existing 30-ft., 3-lane roadway. The curves were eased slightly in the process, but it was necessary to retain the long uninterrupted existing grade. Aside from a few rather minor changes in general alignment, the work consists of widening the existing roadbed to 78 ft. and re-paving.

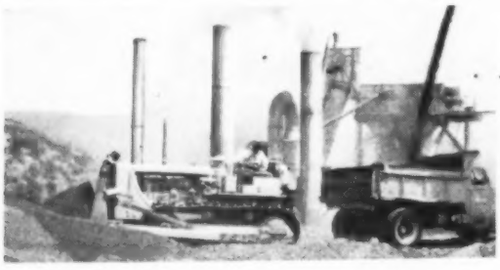
★ End dumping, spreading and rolling fill material, for the large fill shown above

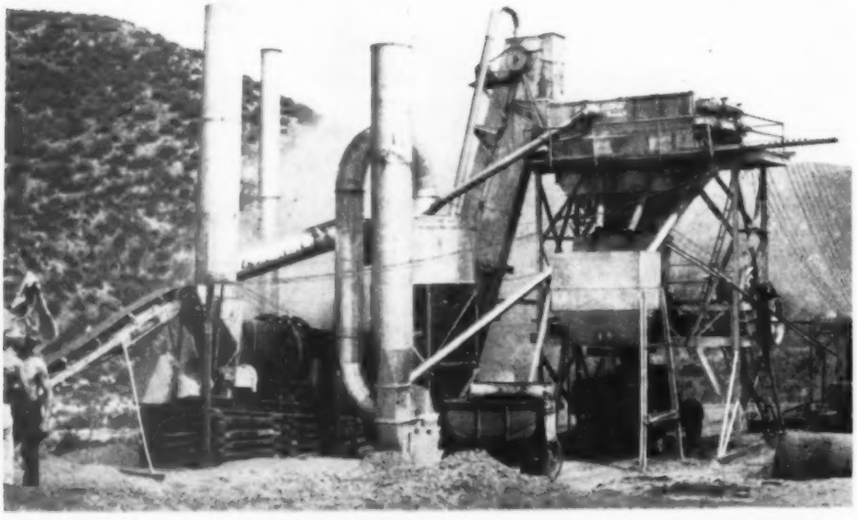
★ A completed section of US 99 after widening, realigning and paving 78 ft. wide



★ The overhead conveyor, after use on the road, was moved and made part of the material plant. Aggregate for hot-mix and stone base was processed here by equipment which included a charging hopper and feeder (beyond camera range at right); Universal primary 20 x 36 jaw crusher with Allis-Chalmers motor, belt drive; 48-in. conveyor belt; electrically-driven shaker screen; secondary Universal roll crusher with Allis-Chalmers motor drive; material then passed to the first of the two 48-in. belts of the special pneumatic-tire-mounted conveyor bridge unit, which is electric-motor-driven; thence directly into waiting trucks, or to stockpile. Material from the stock pile is dozed onto an elevator belt which carries it into the dryer of the hot-mix plant

Clyde Wood's Aggregate and Hot-Mix Plant





★ (Two small scenes) Left: direct truck loading from the overhead belt, and stockpiling with a D7 Caterpillar. Right: Koehring 2-yd. shovel in the pit, loading to one of two 16-yd. shuttle trucks

★ Madsen plant of Southwest Paving Co., subcontractor on the hot-mix. Production averaged close to 1000 tons per 8-hour day

★ Another view of the crusher workings, which by the way turned out as high as 2800 tons of crushed base or hot-mix stone per day

Safety Problem of Long Grades

The accompanying article, together with a previous article ["California's Heaviest Road Job," June '48 R and S], describes how the California division of highways, at great cost, is striving to modernize the spectacular Ridge road between Los Angeles and Bakersfield. The pavement is widened to four lanes divided, and curves eased. But the long continuous grades — several miles long at either end of the 40-mile, high-country section—remain.

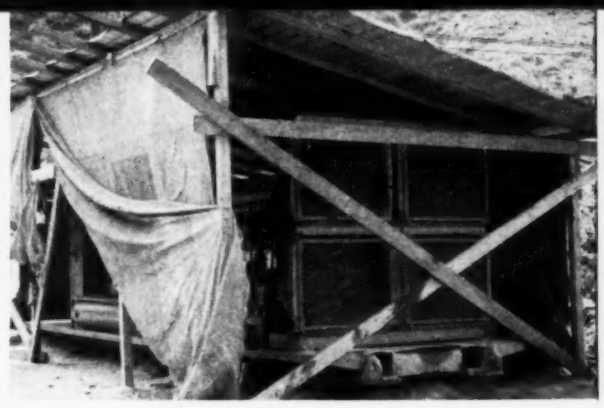
Engineers in other states will watch this stretch of road with interest, since it is a working laboratory. Speed restrictions, re-doubled policing, greater use of caution and warning signs, all will inevitably be a permanent part of the traffic control job there. Long uninterrupted grades—an economic necessity on the Ridge for now—simply are dangerous, and road designers in hill country are trying their best to eliminate them.—**Editors**

Deep Counterforted Fills

Due to lack of stability in the geologic formation of the mountains, precautions were taken to protect high fills against a lateral movement by the construction of heavy buttress fills at their base. Cuts were built back on a slope of 1½ horizontal to 1 vertical and at many critical points benches were excavated at the upper levels to relieve the weight.

The roadway fill was topped out with a full-width layer of pervious material 6 in. thick, followed by a variable thickness (4 to 14 in.) of imported borrow; 6 in. of untreated rock base; a 4-in. layer of bituminous plant-mix, a surface course of hot plant-mixed asphaltic concrete; and a seal coat. The result was a continuous expanse of asphaltic concrete 72 ft. wide, which provides for two 12-ft. lanes in each direction plus a 6-ft. median strip and 9-ft. paved shoulders. Shoulder construction is identical with that of the main roadway except for a different type of seal (Calif. Class C instead of D).

★ Switch house for the hot-mix plant, from which 440-v. current was sent to six motors



★ 540-kw. diesel-powered generator for the hot-mix and crushing operations. A General Motors 300-hp. generator set was "disguised" by mounting four D8 Caterpillar radiators, a replacement radiator not being readily available

★ 5400-gal. asphalt tank wagon of Mercury Transportation Co., waiting to unload into storage tanks below the ramp

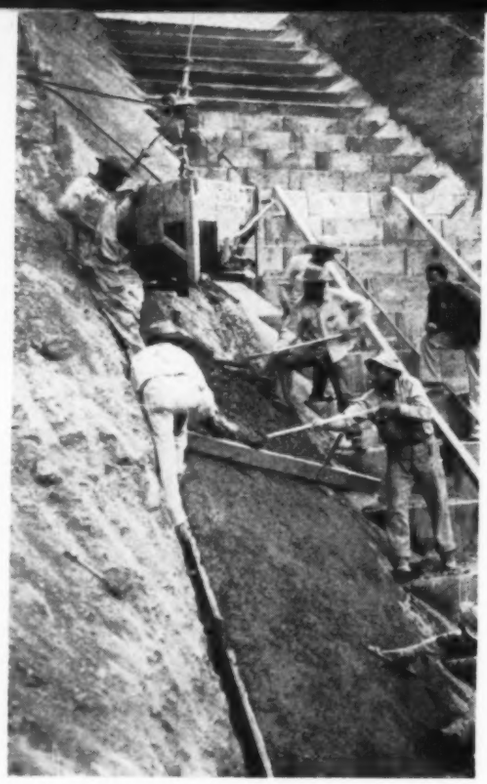
The Wood contract involved 750,000 cu. yd. of excavation. Much of this quantity came from one large cut, the material being used largely to toe out and buttress an equally large adjacent fill (see panorama). Nearly 90% of the excavation had to be moved across the road. In order to accomplish this without traffic interruption, the contractor designed and assembled an unusual overhead belt conveyor unit for a portion of the work [R&S Aug. '47]. The procedure used was to bring material down by bulldozers or scrapers, load by shovel onto the conveyor system, and catch the material in trucks on the outer side of the road. The conveyor was employed for a portion of the work, then moved to the material plant (see pictures with this article) and this cut completed by typical scraper methods, using flagmen to help roadway traffic keep moving.

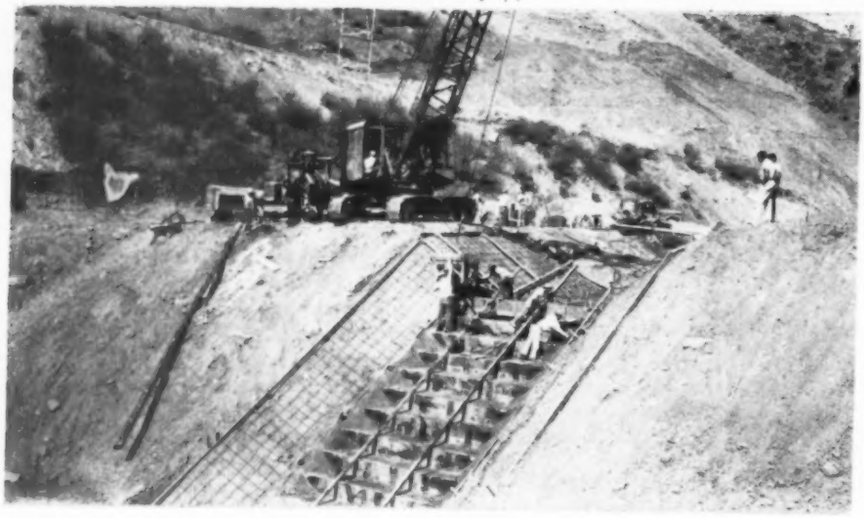
The bulk of the scraper dirt was moved with a fleet of 12 Caterpillar tractor-drawn LeTourneaus and 6 Super C Tournapulls, aided by shovels and heavy dump trucks. Shovels included two Lorains 1½-yd., a Manitowoc 2-yd. and a Koehring 2½-yd.,

★ Wood Roadmixer being operated by the subcontractor, with asphalt tank trailer. 85-100 pen. asphalt used for the travel-plant base

★ Barber-Greene finisher placing one of the seven ribbons of hot-mix surface course. 120-150 pen. asphalt used for this course

★ 3000-gal. water tank truck of Clyde Wood outfit, taking on a load from a creek

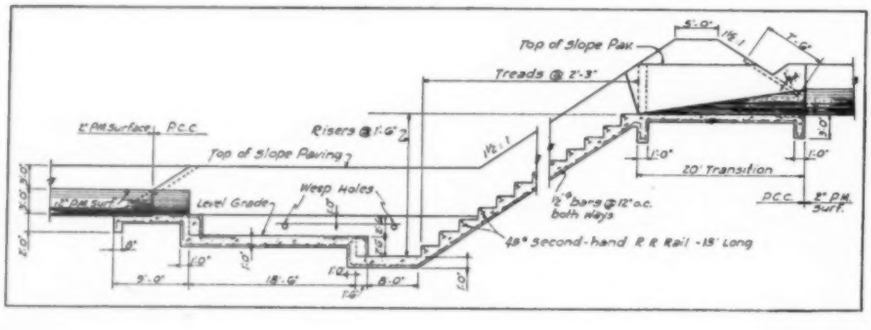




Details of Stair-Stepped "Decelerators" on Clyde Wood Construction Co. Job

At two points below the new widened roadway, special channel construction was required to protect the base of the buttressed fill from erosion. The steep channel was replaced by an asphaltic-lined channel of 0.3% gradient, in conjunction with concrete decelerators and stilling basins

Concrete placement, as pictured here for one decelerator was aided by use of a very dry mix deposited against wire reinforcement. A crane and drop-bucket delivered concrete for the flat surfaces, while one or two men with shovels spread, two men screeded, and one or two men troweled. Note base of counterforted fill in background of lower photo, the roadway being out of sight far above



some of which doubled in the material pit. Grading was stepped up to 5,000 cu. yd. per day, and largely completed by June.

Layered Fills Specified

Construction methods were essentially like those described in the previous article for the Winston job. In widening existing cuts along the shelf location, equipment often had to climb far above the roadway. Similarly, embankment widening began several hundred feet below the roadway, and the larger fills were counterforted. New fill material was carefully tied in by dozers and sheepsfoot rollers after first scalping off the outer surface of the old fill or hillside. End dumping was permitted only as a means of delivering material for subsequent spreading and rolling in prescribed layers.

A feature of the project was the construction of concrete overflow channels at two points along the streambed below extremely deep buttressed fills. These structures were deemed necessary to provide clearance for buttress and protect the toe of the fill and to control erosion by reducing the gradient in the streambed. A paved channel was constructed at a reduced grade of approximately 0.3%, followed by an "energy dissipator," consisting of concrete stairs and stilling trough located on past the fill (see sketch and photos).

Some 4364 lin. ft. of corrugated metal pipe was required in sizes from 12 to 48 in. for culvert extensions or replacements and for internal drainage of larger fills. One 240 ft. length of 36-in. pipe was installed diagonally through the largest fill, to collect ground water and lessen the danger of slides.

Stanley Wood was the contractor's representative on this project, which was carried out under the Los Angeles district highway staff, with Roy Cooley resident engineer, and F. B. Cressy assistant district engineer in immediate charge.

Coming Meetings

Associated Equipment Distributors annual convention; Chicago; Stevens Hotel; Jan. 16-20.

Ohio Highway Engineering Conference; sponsored by State University and Highway Department; held at University, Columbus, Ohio; Jan. 24-26.

American Road Builders' Association; annual convention; Washington, D.C., Feb. 7-9.

National Crushed Stone Assn., 32nd annual convention; New York; Hotel New Yorker; Feb. 7-9.

National Ready Mixed Concrete Assn., 19th annual convention; New York; Hotel New Yorker; Feb. 14-18.

National Sand and Gravel Assn., 33rd annual convention; New York; Hotel New Yorker; Feb. 14-18.

Turnpike Authority is Created in New Jersey

A NEW Jersey turnpike authority was created October 27, with Gov. Alfred E. Driscoll designating as its first project an express toll road from Pennsville on the Delaware River to a junction with main routes at Woodbridge, near Elizabeth.

The Governor signed legislation establishing a three-member, non-salaried agency to plan, finance, construct and operate toll roads. Such roads, he said, will have the dual purpose of speeding through traffic and providing additional access for New Jersey residents and visitors to recreational centers.

The proposed road, known as Route 300, would connect at its southern end with a Delaware River bridge to Delaware, by-pass Camden and other thickly-populated areas of south and central Jersey and join Route 100, now under construction, at Woodbridge. The cost has been estimated at about $85,000,000.

The Governor gave assurance the toll road would not be the sole route available for travel, saying that free highways, well maintained, would be available in the vicinity.

The toll road principle is new to New Jersey, and previously was frowned on, but Governor Driscoll pointed out the state's financial position would be improved.

Newspaper Men Can Sometimes Tell Road Story Best

THAT is the thought passed along to the ROADS AND STREETS editor by F. H. Klietsch, state engineer of Nebraska. Highway leaders giving attention to the public relations side of their work will be interested in what has happened recently in that state.

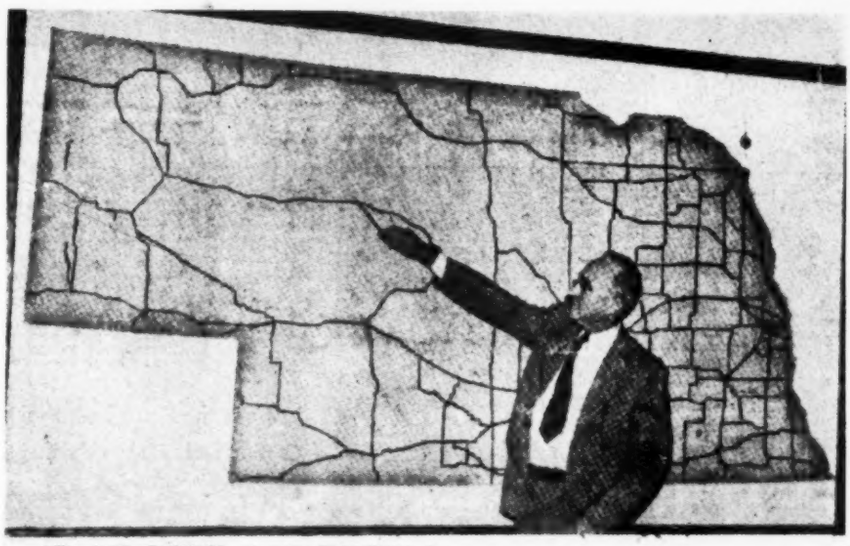
While traveling through Nebraska recently we noted an article, reproduced on this page, which appeared originally on the front page of the Omaha *World Herald*. The clipping aroused our attention for three reasons: its prominence on page 1 of a big-city daily, its simple and straightforward message on road needs, and the fact that the article was one of a series. This paper would certainly seem to be doing an able service for highway development in Nebraska by such publicity.

With this reasoning in mind, we wrote Mr. Klietsch, and received the following modest reply:

"Our Department has nothing to do with the publication of these articles, except to the extent that the writer obtained material from us to serve as the basis for writing them. Sometime ago, while visiting with representatives of the paper, we discussed the difficulty of effectively presenting our state highway problems to the people. This discussion was, of course, the thing that created the idea and, no doubt, influenced the paper to voluntarily present the p r o b l e m through their publication.

"In July of this year, the Department published a small booklet, entitled 'Nebraska Highways Have a Vital Effect Upon the State's Economy.' The series being published presents the point of view outlined in this booklet; however, in a more practical and understanding manner, and, of course, with much wider circulation. I believe the significant point is the fact that an experienced journalist can present such problems in a much more adequate manner than the engineer. We, therefore, feel that this paper is contributing a fine service to our Department and, in a greater sense, to the people of this state."

The World-Herald's series comprised 31 articles in all, each illustrated with a chart, graph or photo. Articles appeared daily from Sept. 19 to Oct. 19 before an audience that included nearly 700,000 "pass-along" readers in addition to this paper's 231,000 daily circulation.



★ Excellent example of front-page publicity which a friendly and enlightened newspaper editor can give if first given the facts on his state's road needs

Snow Removal Facts and Figures

THE national inventory of snow removal equipment for 1946-47, according to a report by Charles M. Upham of ARBA, shows 20,422 displacement type and 456 rotor type plows for trucks, 852 displacement type and 17 rotor type plows for tractors, together with 22,043 trucks, 1,259 tractors, 3,668 graders—and 13,447 miles of snow fence. With this equipment, 305,553 miles of highway were cleared in 36 states at a cost of $37,470,838. The average cost per mile was $123, an increase of 11% over the previous year.

PRA before the war polled the states to determine preferred equipment. Its findings:

Standardization of highway maintenance equipment has long been advocated. The Highway Research Board just before the war made a special study of this subject in order to recommend the most suitable and practical equipment for accomplishing specific maintenance operations. Its poll of the states and Public Roads Administration districts to determine the preferred snow removal equipment yielded these findings:

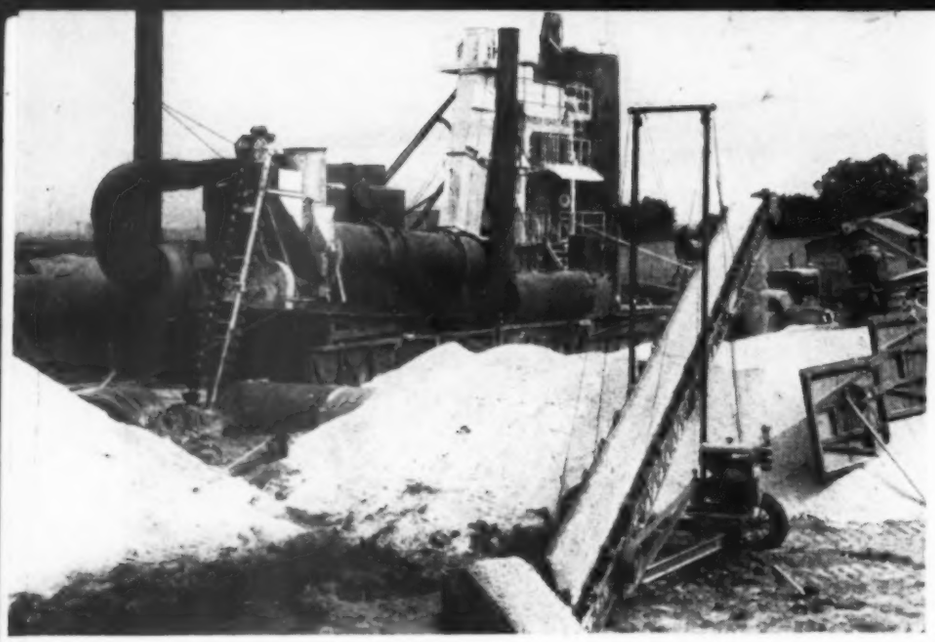
Push plows: to handle 12 to 24 inches of new snow at truck speeds of 12 mph.

Reversible type push plows: efficient in fresh snow depths of less than 15 inches, although they lack the capacity of the one-way push plow.

"V" type plows: to handle up to four feet of fresh snow at truck speeds of 3 to 6 mph. Equipped with wing blades, they are capable of maintaining sections where the maximum snowfall does not exceed nine feet.

Rotary type plows: found essential for opening, widening and clean-up operations where heavy and continued snowfall makes disposal necessary.

PRA makes these general plow recommendations, noted Mr. Upham. For light snows, blades on truck bodies or straight blades; for heavier snows, V-plows with wings; for very heavy snows, rotary plows.



Contractors at Work

★ General view of the Madsen plant with Barber-Greene conveyor and stockpile-covered tunnels—as set up for the U. S. 54 Illinois contracts

Tunnels and Conveyors

Helped Hot-Mix Contractor Race With Frost

Good plant equipment aided Gallagher Asphalt Company in producing and placing as high as 1750 tons of asphaltic concrete per day on Illinois and Indiana resurfacing projects

ON July 23, this past year, Gallagher Asphalt Company of Thornton, Illinois, set up their new asphalt plant along U.S. 54 in Illinois, and began turning out hot-mix for a 40,000-ton resurface project. This job, located between Gibson City and Roberts, consisted of two 1½-in. courses of bituminous concrete, with an extra 1½-in. binder course placed on certain sections having poor soil after first replacing pumping slabs and patching the old pavement.

The plant consisted of a Madsen outfit with 2-ton pugmill, 6'x28' dryer, and job-devised material handling equipment which will be described in a moment. The plant was powered by two Caterpillar D17000 diesel power units, one supplying belt power to the pug, and the other generating current for the other units. While set up for this job the contractor also furnished 11,000 tons of oil mix road materials for Ford County, Ill., and a couple thousand tons of bituminous mix for nearby municipalities.

By September 23—53 elapsed week days and 53,000 tons later—Gallagher was done and his plant being dismantled for moving.

Quick Plant Move

On October 5, the same plant was completely reassembled 100 miles

★ Tunnels converging at the dryer. Materials passed from belt to elevator and started through the plant

★ Another view of the material unloading outfit—under-car hopper and feeder; intermediate belt; 60-ft. B-G stacker belt

away and busy loading hot-mix into trucks for a couple of Indiana road projects. The whole move, which used to require a month or more for such equipment, took only 12 to 13 days. From this location at his home plant Gallagher furnished materials for Rock Road Co., of Chicago, who was the prime contractor for resurfacing 10 miles of U.S. 41 and U.S. 30 in the Hammond and Valpariso area.

By November 5—in 27 more elapsed week days—this 41,000-ton job, too, was done. The performance was aided by exceptionally good weather. It enabled the highway engineers as well as the contractors to breathe easier, as this part of U.S. 30 was considered to be extremely vulnerable to another bad winter, and the Indiana engineers were anxious to get the resurfacing all done before cold weather.

Aiding the Madsen plant on the latter 41,000 tons of hot-mix was a Standard plant of ten years' service, this plant having a 1½-ton pugmill. The two plants for the Indiana work were located at Thornton, Illinois, on the southern edge of Chicago, some 13 miles average hauling distance from the job. Thirty-five trucks supplied the job under a hauling contract by G. E. Riddel, of Gary, Indiana.

In discussing the details of this remarkably speedy performance, J. F. Gallagher, president of the firm, said that their highest day's run was 1750 tons, and that on many days their crews approached this mark. Mr. Gallagher believes this is the fastest day's run for any black-topping road contract in Illinois to date. (The Editors of ROADS & STREETS will welcome any challengers.)

On both the Illinois and the Indiana projects the mix was placed with two Barber-Greene machines. Resurfacing was performed half-width, the lane widths in both states being 11 ft. The Indiana U.S. 30 work involved a divided highway section which has carried extremely heavy traffic. Two 1½-in. binder courses were laid this year, with expectation of placing a rock asphalt topping next year.

Prior to resurfacing, the pavement was given a thorough going over with a mudjacking crew, using a quick-setting under-sealing mixture specified to consist of 14-18 lb. of calcium aluminate cement and 63-68 lb. of water for each 94-lb. sack of normal portland cement. Undersealing was carried out in accordance with procedures developed by Purdue University in conjunction with the Indiana state highway department. The J-P Construction Co. of Chicago Heights, Ill., were the sub-contractors on the undersealing and concrete patching.

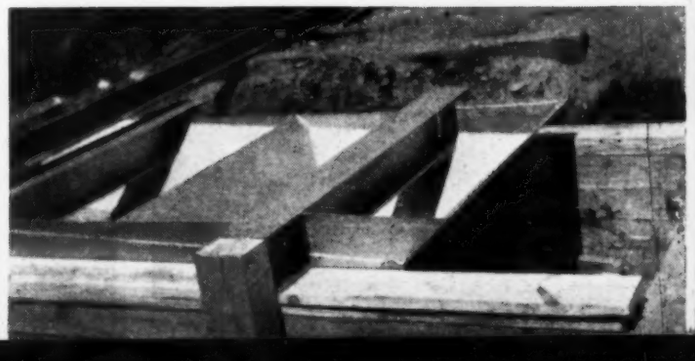
★ Working one of the tunnel gates, which admits material to electric-motor-driven belt. Note metal wiring conduits overhead, for motor outlets and lights

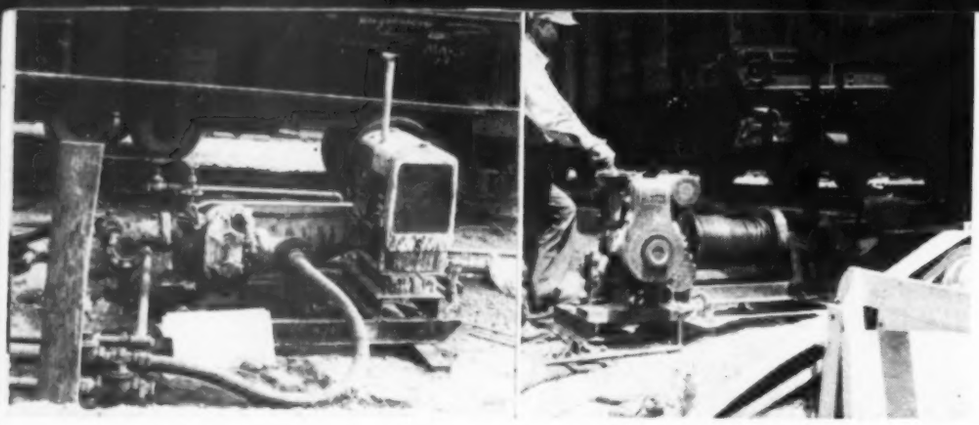
★ A 45-ft. section of the tunnel, loaded for plant move. Armco Tunnel Liner of 84-in. diameter used

No Cranes Used

A departure in the design and operation of both of Gallagher's asphalt plants was the complete elimination of cranes for material handling. Material handling for each plant was accomplished via 7-ft.-diameter tunnels, each 70 ft. long. The tunnels were designed for easy portability. Each consists of a 45 and a 25 ft. section of Armco Tunnel liner, of bolted corrugated steel plate fabrication. The tunnels are set in trenches located under the stockpile area and converging at the plant elevator, one tunnel for each

★ Details of the contractor-built under-car hopper and power feeder for unloading aggregates. Also designed for easy portability





★ Jacketed steam pump and gasoline motor for unloading asphalt cars. (Right): Car mover, consisting of an air-cooled Wisconsin motor with winch line, reduction gear and clutch

★ 110-hp. boiler set for the 100-mile move. Ordinary dolly with dual tires sufficed

★ As much as 6,000 tons of aggregates were stockpiled on the Illinois job. Note rock in foreground, sand in back. Caterpillar tractor with LeTourneau dozer performed clean-up work

type of mix. Each tunnel is equipped with two tilting entry gates for material, spaced at 10-ft. interval. One gate is always usable, should another clog. And two gates insure more complete efficient cleaning up of the stockpile.

The complete material handling procedure for these jobs was as follows: Aggregate dropped from the rail car to a gasoline-motor-powered under-car unloader, thence falling onto an intermediate belt (also gas engine), passing to a 60-ft. Barber-Greene conveyor designed to swivel in a 180-degree arc for building stockpiles over the tunnels. The under-car unloader was a Gallagher-designed unit, as were many other material handling components of the plant.

Material dropping into the tunnel traveled by belt to a point just outside the tunnel, then was carried by the cold elevator to the dryer.

This plant set-up had other design features of special interest. In addition to seeing that all equipment is easily portable by trailer, Mr. Gallagher and staff sought to include numerous refinements, some recommended by the manufacturers and some of his own design, which would insure utmost safety and efficiency. One such refinement was the elimination of all loose electric wiring. All electrical connections in this plant are of a quick plug-in type. Wiring inside the tunnels is built in with weatherproof conduits and switch boxes.

L. E. Fawsett and A. C. Kepler are Gallagher's plant superintendents. The Illinois U.S. 54 project was carried out under supervision of the Ottawa district of the state division of highways, R. W. Gerling, district construction engineer, C. E. Cullen, district materials engineer, with Andrew Meloan resident engineer. The Indiana work was under the LaPorte district, D. G. Goodwin, district engineer, with Walter Shearer resident inspector and Ray Seely plant inspector.

★ A Lorain truck crane handled the heavy pieces on and off the trailers

★ The completed plant. At right is a dust tank, included here to meet Illinois mineral filler specifications. Lime dust taken from bulk cement cars by unloading screw, then via conveyor and bucket elevator to tank

What Limit to Big, Heavy Vehicles?

The problem of sizes and weights of motor vehicles, as seen through the eyes of the men responsible for keeping the highway from going to pieces—the maintenance engineers

EVERY highway official in the country is gravely concerned over the increasingly heavy maintenance charges being made against highway revenue. During the year 1946, the state highway departments of this country spent approximately $355 million for maintenance and all levels of government spent $890 million. In 1947, the state highway departments spent $446 million and all levels of government spent a total of $1,080,000,000. One state is now spending approximately sixty-five cents of every highway revenue dollar on maintenance.

From time to time, reference is made to the heavy increase in highway revenue accuring to state highway departments and, obviously, revenues at the present time are at a considerably higher level than prewar. For example, in 1947 the states received from all highway revenue sources approximately $1,839,000,000 (excluding federal aid), but it is ridiculous to assume that highway costs are still at prewar levels and that this increase in revenue means that the highway departments have more money than they know what to do with. For instance, when all other deductions have been made from the 1947 revenues, there remained for new construction only $572 million, as against an income of $1,839,000,000.

Two typical allocations of this total —indicative of the uses to which such revenues are put—are those funds set aside for the maintenance of the state highway police and the return to local levels of government of highway funds. The highway patrols received, during 1947, approximately $46 million and there was returned to the local levels of government approximately $484 million. When we consider the remainder of 1947 funds available for new construction, in the amount of $572 million, and realize how little impression that amount of money makes in providing new highways to meet current needs, we can appreciate the full significance of the concern of the highway official with maintenance costs. Under these circumstances, it is absolutely essential that he maintain roads that should be rebuilt. *There is a serious question of whether the highway departmens can ever catch up with the highway demands, and so we must look to the continued maintenance of roads, at increasingly heavy costs, that otherwise would be retired from service.*

This timely and challenging paper is a report of a Special Subcommittee of the Operating Committee on Maintenance and Equipment, of the American Association of State Highway Officials. It was presented by the Association's Executive Secretary, Hal H. Hale, before the annual meeting of the Southeastern Association of State Highway Officials, Nov. 4, 1948, at Edgewater Park, Miss.

Conflict of Interest

One of the most serious aspects of the maintenance question has to do with the sizes and weights of motor vehicles operating over our roads. The question of limitation of sizes and weights of motor vehicles always has been a difficult one. It goes without saying that uniformity, or near uniformity, in state legislation controlling this question, is desirable and to that end the American Association of state highway officials a good many years ago adopted a national policy on the matter. The various state Legislatures, however, enact our laws, not the Association. This policy subsequently has been revised several times, the most recent revision being in 1946.

From the very beginning there has been a conflict of interests between the highway official and many of the commercial carriers operating over the nation's highways with their understandable desire to carry the maximum possible pay load. The highway official, whose responsibility it is to preserve and protect the 30 some odd billion dollars invested in our highways, must insure, in so far as possible, the maximum economic life of these roads. It is perfectly possible, with today's technical knowledge, to build a road capable of sustaining almost any load that could be placed upon it by almost any motor vehicle. It is not always possible, however, under present revenue procedures, to finance the building of such a road and it is impossible, even though technical knowledge and financial ability are available, to secure such roads over any appreciable mileage of our highway system in any brief time. Therefore, the highway official must, in so far as state laws permit him to do so, impose limitations on the sizes and weights of motor vehicles in order to preserve that vast mileage of roads built 10, 15, 20 or more years ago, and to replace them with new and heavier construction as conditions permit.

From time to time, various proponents of larger and heavier vehicles have implied or inferred that the heavy loads do not damage the roads any more than natural causes or the elements would damage them, and therefore limitations such as have been applied are unecessary. It would be naive to say that the elements do not damage the roads. It is also naive to say that heavy loads do not damage the roads. It is perfectly possible for the natural elements to do more damage to a highway in thirty minutes than heavy loads would do to it in ten years, but this would not be a normal display of elemental fury. For example, floods during the past year, in the states of Oregon and Washington, have done millions of dollars worth of damage to the roads and the very frequent Florida hurricanes are noted for the damage they do to the highway system of that state. While the pumping of a joint under repeated heavy axle loads is less spectacular than a Washington flood or a Florida hurricane, the ultimate end is the same; namely, increased revenues for maintenance purposes in order to keep the highway open to traffic that must move over it.

Cites Freuhoff Statement

Some months ago, there appeared in the Congressional Record an address by the Vice President of the Fruehoff Trailer Company, titled "The Full Uses of Existing Highways." In that address, the opening line was "What

is Par in SWR." (SWR means sizes, weights and regulations). A little later on in the paper we find the sentence "Isn't there any par on this public course—these roads and streets that have been built and are maintained with the tax money which comes, directly or indirectly, from American industry?" This paper, in general, is a challenge to the policy on sizes and weights adopted by the AASHO in 1946 and proposes, among other things, an increase in the limitations fixed in that policy to permit an overall length of a single unit of 40 ft., an overall height of 13½ft. and an overall width of 102 in. (on prescribed highways).

Now, his question "Isn't there any par on this public course?" is an interesting one and the wording obviously metaphorically alludes to par on a golf course. This is, in general, a good comparison. How is par determined on a golf course? According to the best information available to this sub-committee, an organization known as the American Golfing Association is the ruling body for the game of golf. Presumably, the Association is composed of exert gofers and in their long years of experience, they have reached certain conclusions and have established certain rules to govern the game. It would appear that over the years their experience has indicated that the distance between greens is one of the prime factors in the number of strokes that are required in fixing par. For example, up to 250 yd. the experts figure three strokes for par, on the assumption that a good golfer can drive 250 yd. to the green in one stroke and allow two putts into the hole, fixing a par three. Certain hazards, traps, etc., may require an additional stroke or two. Now, 251 to 450 yd., and the experts say the hole should be a par four, also modified by any existing hazards. In fixing these standards, the experts realize there are a few who may consistently make the hole in less than par, but the experts have fixed the standards for the average and not the exceptional golfer. It should be observed that these rules are laid down by an association of experts empowered by their organization to do so. *It should also be observed* that it is the *experts* who fix these rules and not the manufacturers of golf clubs, golf bags, golf balls, or the individual golfers. Again in comparison, the highway official is the expert in the highway field. He has consulted and will continue to consult with those allied interests concerned with the use of the highways, but when it is boiled down, it is he and he alone who must assume the responsibility for the preservation of the funds—the public funds if you will—that are invested in the highway system. Not only is he responsible as a public official, but in some states, he is responsible as an individual as well and is subject to suit, on occasion, for failure of roadway surfaces, highway bridges and other structures. These are *personal suits* against *him* as an *individual*. In the paper above-mentioned, there is a sentence as follows: "The people come first." This is a very sound statement. The people do come first and the highway official is under oath to see that their interests are protected.

Most Trucks Small

At the present time, there are 40,557,000 vehicles — automobiles and commercial vehicles, including buses—registered and using the nation's highway system. An additional 500,000 vehicles owned by government agencies will bring the total registered for 1948 to about 41 million. The total registration for trucks and buses is approximately 7,332,000, a sizable number, but still a small percentage of the total number of vehicles. A far greater percentage of the total truck and bus registration are those many light vehicles used on the farm, for delivery service, converted passenger car chassis, etc., and they do not present the problem that the heavy carrier presents. In the Highway Research Abstracts of Sept., 1948, Page 1, is an excerpt and analysis of a recent bulletin published by the Automobile Manufacturers' Association, which reads as follows:

"Most of our trucks . . . are small. Nearly nine out of ten are designed for loads of a ton-and-a-half or less."

Perhaps the latest accurate, factual study of this subject was that of the 1941 truck and bus inventory made by the Public Roads Administration for the War Department. That inventory indicates that 52% of the trucks then registered were of less than one ton capacity; 47.2% were from one ton up to, but not including, three tons; 0.7% were from three tons up to, but not including five tons and only 0.1 of 1% of all those trucks registered at that time were of five tons or greater capacity. It is reasonably conservative to estimate that at this time, in the year 1948, approximately 48% of the registrations would be of one ton or less; 49% from one to three tons; 2% from three to five tons, and 1% of five tons or over. So, the problem of sizes and weights of motor vehicles is largely one brought about by a very small percentage of those vehicles operating over the nation's highways. This fact is worthy of consideration in reviewing present highway user revenue schedules. It also should be considered when demands are made upon the state highway department for liberalization of their size and weight regulations.

Some few weeks after the appearance of the first mentioned statement in the Congressional Record, the House Committee on Interstate and Foreign Commerce held hearings on matters pertaining to transportation. Appearing before that committee was one Mr. J. S. Worley, former professor of engineering at the University of Michigan, now in consulting practice, and known to some of you. He submitted testimony on the question of whether or not the nation's highway system was being used efficiently and, particularly, to its capacity. His testimony indicated he did not think it was. There were many striking similarities between Mr. Worley's presentation to the House Committee and that document appearing in the Congressional Record, previously referred to. Mr. Worley stated to the House Committee that he was appearing only as a plain citizen. He commented on the fact that we have a transportation plant in this country valued at 32 billion dollars, which was largely paid for—all of which is correct. Mr. Worley indicated that only in some of the larger urban areas were our streets and roads overloaded. He said further that "we are taking steps to correct this and should take step to correct the situation but this is a *rather minor part* of our highway plant." **He was evidently unaware of the fact that as of January 1, 1947, the responsible highway officials of this country estimated, and so advised the House and Senate Roads Committees of Congress, that to bring our road system up to the standards required as of that date, it would necessitate an expenditure of approximately 22 billion dollars and that the urban areas, which he referred to as a *minor part* of our great highway plant, would require the expenditure of approximately six billion dollars of that total.**

Liberalization Case Questioned

Of course, Mr. Worley's presentation was also a plea for considerable liberalization in sizes and weights of vehicles, which means the heavy carriers, since the average automobile driver is not concerned with this question. Mr. Worley said that in his State of Michigan they were allowed to carry 120,000 lb. on a 9-8 axle or a 9-axle combination, 50-60 ft. in length, on any kind of a road, from a dirt road to the finest stretch of concrete road, and they had experienced no serious results from these loads. He said, further, that these loads were being carried on dirt roads, neighborhood

roads and township roads and, incidentally, over bridges built in 1890. Mr. Worley stated that in his City of Ann Arbor, where they are "thrifty people," the streets have been paved with a little sprinkling of oil on the surface and that the paved surface on those streets was not over "one-quarter of an inch thick" and that there was no restriction on motor vehicles moving over these streets. He admitted they occasionally had a few weak spots and that steps would be taken to correct them. It is interesting to note that in 1947, his state of Michigan spent a little better than 15 million dollars in correcting "weak spots" and other maintenance operations. It is safe to say that if, in his area in Michigan, they are regularly carrying 120,000 gross loads on pavements one-quarter of an inch thick, a lot of highway officials in a lot of states have been wasting a lot of public money for a long time.

In commenting on the policy on sizes and weights of the AASHO, Mr. Worley said that the "specifications" adopted by the AASHO were a forward step; however, these specifications were not the product of a comprehensive study, but a compromise of 48 disagreeing parties. Observe this "compromise of disagreeing parties." It is this same procedure under which our representative form of government has continued to prosper and progress over the past 150 years. The alternative to such compromise is totalitarianism. It is difficult to believe that Mr. Worley, or any interests he may represent, believes that this latter method is the solution to the problem of sizes and weights of motor vehicles.

It is perfectly obvious that occasions will arise where loads beyond those prescribed by law must be moved over the highways and most states have provisions for special permits for such movements. This was the case during the war when many oversized loads were moved in that manner simply because there was no other way to move them. However, the special permit method is frequently abused, as are other provisions of the sizes and weight laws, and it would appear that this is done all too frequently in an effort to evade the size and weight limitations.

Special Privileges Abused

An enlightening example of what these special permits can lead to occurred in one of the western states recently. In that state, permission is granted for the movement of oversize and overweight loads by special permit. On this occasion, for good and sufficient reasons, a permit was issued by the state highway engineer to move an oversize load—not an overweight load. In the course of that movement, the oversized load attempted to pass a gasoline carrier on one of our many narrow bridges, with the result that they had a collision, the gasoline carrier exploded, and the bridge was destroyed. Someone was to blame for this accident and, of course, the State is making every effort to collect damages but, nonetheless, the people of that state suffered the loss of a valuable structure and the inconvenience of closing that road for months, in an area where roads are few and far between. They probably will have to pay double the original price in the end to build a new bridge (the funds coming from current highway revenues badly needed elsewhere)—all because of a special permit for an oversized load.

There are many narrow bridges on our highway system, the replacement cost of which would be terrific. This direct question was asked Mr. Worley by a member of the Congressional committee: "What about the width of the bridges? Frequently, you come to bridges that are much narrower than the road." Mr. Worley's answer to that question was as follows: "We have had, and discussed at great length in our engineering circles, discussions with reference to frequency. It is largely theoretical. From experiments in our laboratories we know that if we stress metals or other materials rather frequently, and many times, they will eventually fail from fatigue. We also know that they have a certain amount of recovery. I have difficulty in seeing where, as a rule, we would ever have loads passing over a highway to the extent that that would be of any particular consequence." The record does not indicate that the question of the width of the bridges was answered.

Another example of the special permit problem faces a mid-western state that happens to be the center of a large pleasure boat building industry. More and more requests are coming to that department for special permits to move boats with 12 to 14 ft. beams, although waterway facilities for such movements are available. How loads of 12 to 14 ft. widths can safely pass motorists on 20-ft. highways is a question, and to what extent special permits should be permitted to void regular size and weight limitations, as a continuous operation, is highly debatable.

As an example of the influence of traffic on maintenance costs, let us compare the cost records of two sections of pavement in the same county of a state in the Middle West. These two separate sections of pavement were constructed by the same contractor with the same typical section design and the same aggregates; the only difference in these two sections of road being the volume and weight of traffic passing over them; yet the average surface maintenance cost of the road carrying the lighter traffic has been $56.12 per mile per year over a 17-year period, while the surface maintenance cost over the section carrying the larger and heavier volume of traffic was $232.41 per mile per year over the same period of time. These costs are up to and including 1947, but do not include 1948; and, in addition to this, it was necessary in 1946 to place a hot mix bituminous surface over the section of road carrying the heavier volume of traffic at an additional cost to the highway department of some $12,000 per mile.

Where Responsibility Lies

Maintenance of roadways is a continuing and expensive operation. The maintenance engineer is gravely concerned with the problem. Joint pumping and shoulder maintenance are problems brought about by heavy axle loads and wide vehicles. The highway engineer, if he is true to his oath of office, has only one answer, and that is to try to limit such sizes and weights in the manner that his best engineering judgment and counsel indicates they should be limited to preserve and protect the investment the taxpayer has made in the highway.

It is in order to make an observation at this point. The advice and counsel of qualified non-official groups, organizations and individuals has been and will continue to be sought by the highway official, but it is he and he alone who must stand before the court of public opinion and be responsible for and justify his actions as a *public official*. Those non-official counselors, who for their own good and sufficient, and probably sometimes selfish reasons, are not in accord with his policies, do not stand with him before that inevitable court. Whatever other charges may be leveled against him, and being human he is not perfect, lack of technical ability and professional highway engineering qualifications are not among them. The professional engineers of the world beat a path to his door to study his techniques and accomplishments and thus pay tribute to them.

It is the opinion of this sub-committee that the expert who should determine "par" in this field is the highway engineer, not the part-time expert, or the manufacturer of heavy equipment, or the commercial carrier who hauls for hire and profit over a public facility.

Converting Triaxial Test Data

Graphical Methods for Converting to Stress-Strain Curves

This article appeared as a special contribution in "Highway Research Abstracts, Sept., 1948, published by the Highway Research Board.

By R. J. Hank,
Materials and Tests Engineer, and

Harry A. Sandberg, Jr.,
Associate Asphalt Engineer, Materials and Tests Division, Texas Highway Department

THE increased use of the triaxial device[1] for testing large specimens of asphaltic concrete, flexible base and other materials at the Materials and Tests Division Laboratory of the Texas Highway Department has led to the use of a series of straight-line graphs to facilitate the conversion of test data to stress-strain curves. By entering these graphs with the applied load and the corresponding specimen deformation, the resulting axial stress (corrected for increase in diameter of the specimen) and the percent strain may be obtained by direct reading.

The graph illustrated herein (Fig. 1) is applicable to the proving-ring type of loading device, but a similar graph may be made for any type of press. The scales shown in Fig. 1 for proving ring deformation, specimen deformation, stress and strain were selected to give the following degree of accuracy:

Stress — ± 0.1 lbs. per sq. in.
Strain — ± 0.01 percent

To maintain this degree of accuracy, a graph of this type on 8½ x 11 in. paper ordinarily may be made to cover a loading range of about 1,000 pounds. Thus, several sheets usually are necessary to cover useful range of loading.

Other constants used in the preparation of the graph are: Range of specimen diameters—6.20 to 6.25 in. Range of specimen heights—6.00 to 9.00 in.

Plotting of Graph

1. For **Stress Lines** (labelled with specimen diameters, 6.20 in. and 6.25 in. in Fig. 1), S_u is plotted against R and is calculated by substituting a series of values of R in the equation

$$S_u = \frac{W + kR}{A}$$

where S_u = uncorrected vertical stress (p.s.i).
W = dead load of testing head (17.5 lbs.).
k = proving ring calibration constant (7 lb. per .0001 in. deformation).
R = proving ring deformation (0.0001 in.).
A = initial cross-section area (sq. in.).

If loading device permits direct reading of applied load in pounds, substitute P for kR in the above formula, where P = applied load in pounds, and make corresponding change in scale in Fig. 1.)

2. For **Specimen Height Lines** (labelled 6 in., 7 in., 8 in., and 9 in., in Fig. 1) percent strain is plotted against specimen deformation. The values are obtained by assuming various deformations for a given height in the equation:

$$\text{Strain } (\%) = \frac{\triangle h}{h} \times 100$$

where $\triangle h$ = specimen deformation (inches).
h = initial specimen height (inches).

3. The **Correction Factor** scale was computed from the equation

$$F = 1 - \frac{\%\ \text{Strain}}{100}$$

where F = Correction Factor.

4. For **Corrected Stress Lines** (the light lines slanting to the right in Fig. 1), S_c is plotted against F from the equation $S_c = F\ S_u$ where S_c = Corrected Vertical Stress (p.s.i.).

Procedure for Using Graph

1. Locate proving ring deformation on right hand vertical scale of graph.
2. Project horizontally to stress line and locate stress on upper horizontal scale. This is the **uncorrected** vertical stress.
3. Locate specimen deformation on bottom horizontal scale.
4. Project upward to intersection with specimen height line. The horizontal line through this intersection will be termed the "correction line."
5. Read percent strain from left hand vertical scale. (Correction factor is not needed except when plotting the graph.)
6. Project the correction line horizontally until it intersects the corrected stress line passing through the point on the stress scale representing the uncorrected stress. Read corrected vertical pressure at point on stress scale directly above intersection.

Sample Calculation

(Illustrated by dashed lines in Fig. 1)

Data:

From ring deformation	1001.8
Specimen deformation	0.15 in.
Specimen height	7.756 in.
Specimen diameter	6.207 in.

From Curves:

Uncorrected stress	209.2 p.s.i.
Percent strain	1.93 %
Corrected stress	205.2 p.s.i.

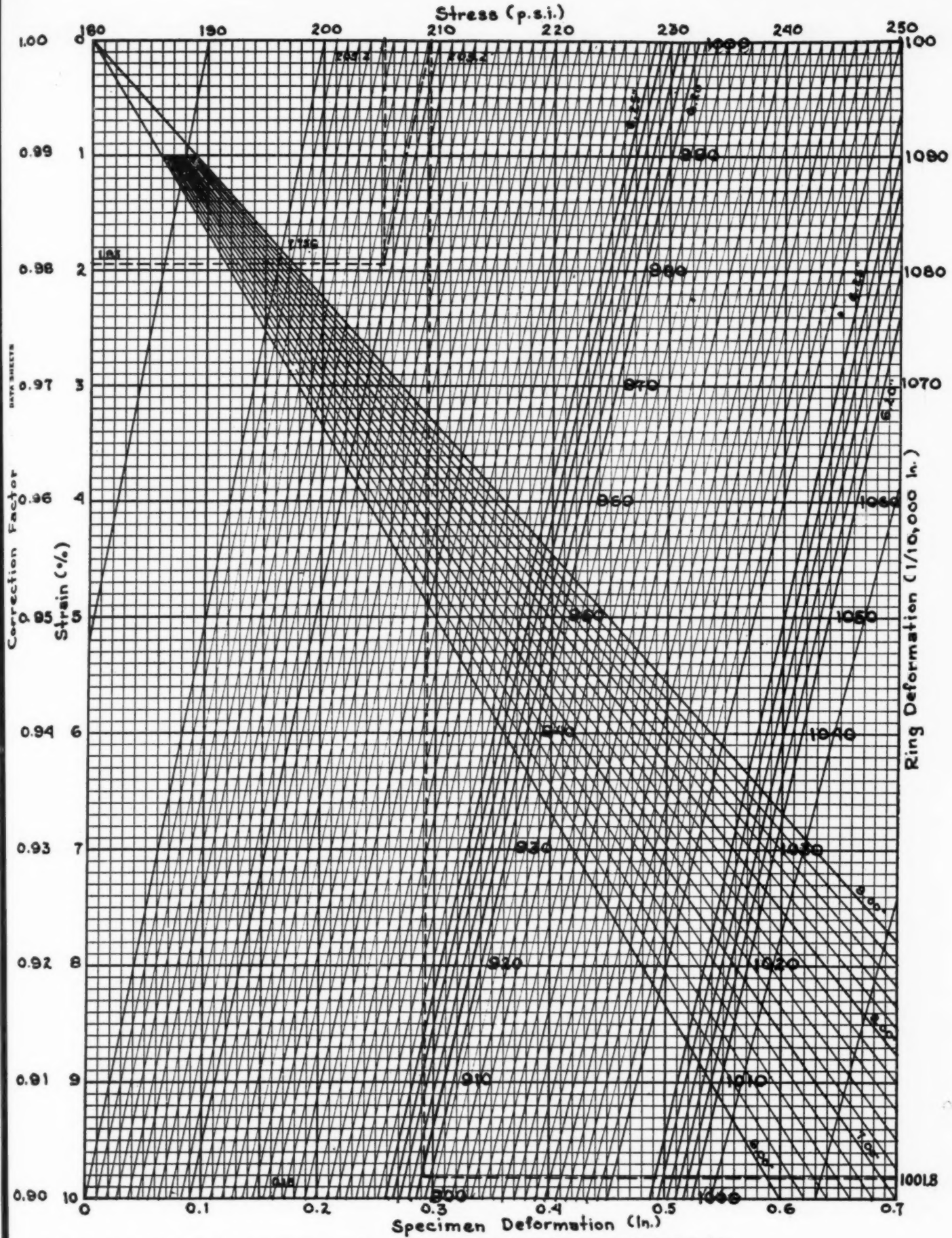
●

State May Go Into Cement Business. When the Oklahoma legislature meets in January it will be presented with a recommendation by its roads and highways committee for an investigation of the feasibility of a state owned cement manufacturing plant.

Clearing House Section Outstanding Used Equipment Values

One hundred individual advertisers feature an exceptionally large selection of used equipment in the 9-page "Clearing House" section which starts in this issue on page 103. Readers will find the "Clearing House" a dependable and informative directory of outstanding values in used equipment and we suggest that you make perusal of these pages a regular habit each month. At any time that you have equipment you wish to sell, anywhere in the country, we suggest that you present your offerings in our "Clearing House." This section is growing faster, getting larger every month, because it's doing a better, quicker selling job—at one low cost!

[1] "Progress Report on Development and Use of Strength Tests for Subgrade Soils and Flexible Base Materials" by Chester McDowell. Proceedings, Highway Research Board, 1946.



★ Figure 1—Curves illustrating accompanying explanation of graphical method of converting triaxial test data to stress-strain curves

Costs to Remain High

is concensus of panel speakers at the Public Works Congress in Boston

Record registration of 530 reported at annual congress of the American Public Works Association

HIGH construction costs were discussed in a notable five-speaker panel meeting at the APWA's annual Public Works Congress, held in Boston, October 17-20. Under chairmanmanship of major general Philip B. Fleming, federal works administrator, representatives of labor, contracting, the material manufacturer, the engineer, and the public viewpoint took their turn in a thought-provoking series of statements.

The general verdict was that public works leaders can expect little, if any, price relief in the foreseeable future. As a corollary, it was shown that building agencies today are getting something of a bargain in their investment of the construction dollar, which will buy $1.23 worth of improvements, on the average in relation to the general commodity dollar compared with prewar days.

The 3-day Congress also included a general-session paper by Arthur B. Allen of the Zia Company on the contract method of municipal administration, as now being applied at Los Alimos, New Mexico; notable words from an unique personality, Dorothy McCollough Lee, long the director of public works and recently made mayor of Portland, Oregon; a paper "Adequate Street Lighting, a Community Necessity," by R. M. Sweetland of General Electric Company's Illuminating Laboratory; and a talk on rat control and its importance by H. A. Merrill, U.S. Department of the Interior, Boston. Fourteen breakfast and luncheon round-table discussions on as many topics were also held, a feature which is expected to be expanded at next year's Congress when discussions will be extended to half-day periods.

No Cost Relief

In laying the groundwork for the construction cost panel, chairman Fleming pointed out that highway programs as well as private housing and industrial construction is slowed by resistance to today's high costs. First

W. A. Xanton

speaker, Ernest A. Johnson, of the Building and Construction Trades Council, Boston, reminded that labor still remembers the depression experience, when in Boston workers agreed to take a 20% cut in wage rates as an aid in stimulating construction activity. This step was taken without any assurance given that employer groups would take measure to create more employment. It was said then that labor rates were not the main factor in construction volume, which was influenced more by the outlook for a return on capital investment in new plant and on the need for the new facilities. If this is true, he said, why so much stress today on wage rates? While attempting to justify today's hourly rates this speaker did not contribute to any conclusion for the future except to infer that wages will stay high.

Chief hope for lower construction costs lies in present efforts to increase mechanization, step up efficiency and improve designs, said Harold E. Foreman, managing director, Associated General Contractors of America. More efficient construction is being promoted on a wide front through the innovation of joint committees with AGC and with the highway officials, aviation officials, the ASCE and other groups.

Costs of construction will tend to follow general commodity prices, he emphasized, although construction prices haven't gained as fast as the general commodity index. With 100 as a base for 1945, he said, quoting the U.S. Bureau of Labor Statistics' wholesale index, all commodities rose 57% to June, 1948, while the AGC's construction cost index advanced 44% in that period and the composite mile index of Public Roads Administration rose 40%. The AGC index is now up 112% from 1939, and the PRA index for road construction is up 72% from that year (unit prices, not actual per-mile road costs, which have advanced relatively faster due to higher standards of design and construction).

Harrison P. Eddy, Jr., of the firm of Harrison P. Eddy, consulting engineers, Boston, said that his firm is often asked to advise on whether to go ahead with construction at today's prices. He said that his clients are more anxious to build today than ever, in spite of prices, since prosperous times are the times when private business can most capitalize on improved physical plants. He foresees no substantial drop in costs because there is no disposition for labor to cut its hourly rates even in times of curtailment. "Economic and socialistic conditions underlying our present economy all seem at least to sustain the present high rates," were his words. Costs are more likely to advance.

"Too High? Hell, Yes"

"Are costs too high? Hell, yes," was the rebuttal viewpoint taken by Samuel S. Baxter, assistant chief engineer, Bureau of Engineering, Surveys and Zoning, city of Philadelphia. Speaking for the consumer he noted the plight of his city as being typical in that urgently needed municipal con-

Donald Herrick, executive director of American Public Works Association, reported that the Association's membership has gained over 400 in the past year, reaching a new high of 1,534.

APWA Officers for 1949

President: William A. Xanten, superintendent, division of sanitation, District of Columbia department of public works, Washington, D. C., succeeding James W. Morgan of Birmingham, Ala.

Vice-Presidents: Re-elected were Robert S. Anderson, superintendent of public works and village engineer, Winnetka, Ill.; and W. A. Gayle, city commissioner, Montgomery, Ala. Continuing in office: E. J. Cleary, Engineering News-Record, N. Y.; Walter N. Frickstad, Oakland, Calif.

Directors: Re-elected were William S. Foster, American City, N. Y.; Milten S. Rosen, St. Paul, Minn. Carry-over directors, W. O. Jones, Fort Worth, Tex.; Allan Rogers, Garden City, L. I.; J. W. Morgan, ex-officio.

Treasurer: Glenn C. Richards, superintendent of public works, Detroit, re-elected.

struction deferred in the '30's was further delayed by the war and still awaits construction. Meantime, new concepts of municipal service and new techniques and discoveries have made more elaborate improvements necessary.

Philadelphia's city revenues have increased only 26% from 1940 to 1948. A city cannot easily raise the price of its services, like a private business sometimes can to pay off the cost of new plant, so is caught in the price squeeze.

Labor rates are no longer competitive in the sense that a worker competes in the labor market, in these days of negotiated union area rates. The complaint is often made that men do not perform a full day's work and that men must be hired who aren't needed, he also noted, saying that if true these conditions must be corrected.

Melvin H. Baker, president, National Gypsum Co., Buffalo, said that building materials prices are "well within the level of our present-day economy," having increased only 68% from 1939, excluding lumber. The cold facts are that costs are still advancing, which foretells higher cost to come. High taxes, increasing wage rates, freight, fuel and power costs, are all to be expected, and not too much relief can be hoped for due to more competitive business conditions, thinks Mr. Baker.

Committee Reports

The various APWA standing committees met and brief reports were given at the final assembly. Fragmentary notes on several of these reports include the following tidbits:

Household garbage grinders today number 350,000 with some 2,000 more in hotels . . . Their uses poses numerous problems . . . Prohibited by law in New York City, Philadelphia, Miami, Knoxville, Youngstown, York, Pa.

Traffic committee has just published a detailed report on traffic engineering functions and administration . . . result of several years' joint effort with committee representation from other interested associations.

Street maintenance: the committee plans to compile and correlate a list of the many articles and reports on the subject scattered through back issues of the APWA yearbook . . . urges that a recommendation be compiled on how to plan, organize and keep records of street maintenance work.

Equipment: this committee has issued a recommendation on requirements of procurement procedures, bidding forms, specifications and contracts which are objectionable to many equipment manufacturers.

Bituminous pavements: 1946 specifications of the Association are to be brought up to date, particularly to include reference to the new ASTM specification on hot mix.

Snow Removal: The street cleaning committee is compiling the results of questionnaire data on snow removal practices from cities over 200,000 pop.; plans to concentrate on this subject for next two years.

Street Lighting: as reviewed by chairman W. A. Porterfield, vice-president, Union Metal Mfg. Co., Canton, Ohio, this report noted the great variation in street lighting cost rates incurred today by municipalities, with respect to both publicly and privately owned utilities. Rate studies were recommended by cities to make sure that they are getting rates which give the benefit of every possible economy while allowing for stable expansion. Much complication is caused by permitting lighting facilities to be expanded without a plan. City leaders are urged to make greater effort to educate the public as well as municipal personnel on the benefits of adequate lighting. The committee "unanimously agreed that installing modern street lighting according to the I.E.S. code does reduce traffic deaths and accidents as well as crime."

The fourteen roundtable discussions also brought out facts too voluminous to review fully. A few notes, again:

On municipal organization, a report by Stanley Pinel of Griffenhagen & Associates reviewed the principles of sound municipal organization, noting the frequent weakness of city organization which gives the city official too large a "span of command." An executive at the policy making level can give proper attention to only six subordinates, he said, going on to urge that organizations be adapted to the personnel rather than being too rigid in setup.

Marshall Dutton, commissioner of public works of Oak Park, Ill., told of a job evaluation survey, as a basis for determining rational employe compensation, which led to correcting inequalities and to better employe relations.

Street Cleaning: detergents were tried as an additive in street flushing equipment by one city, but proved too costly . . . Increased attention is being given to mechanical leaf collection, one city employing a portable hay baler; others, suction-type equipment . . . One small city is successful with a scheme of making property owners place grass cuttings in baskets at the curb for pick-up.

Snow Removal: In hauling snow, it helps to swab the inside of the truck body with salt brine, kerosene or liquid wax, to minimize sticking and aid in

Woman Puts Us to Shame

Public works officials at Boston who might have come there with a human tendency to be discouraged over their many problems, were given a "lift" by the banquet speaker, Dorothy McCollough Lee, mayor-elect and formerly public works director of Portland, Oregon. Starting off with a refreshing exclamation at the marvelous things men in public works can do when they have the money, she noted that for many years the functions of city government have been gradually taken from city officials by higher government levels. Decrying the dwindling finances of many cities, she blamed the situation on the lack of proper representation of cities and rural-minded state legislatures.

Cities today need missionaries who can translate public works needs into simple terms the average citizen can understand. Until this is done, unselfish efforts toward city betterment will be defeated by organized groups with hostile purposes.

Powdered Rubber Admixture

Used Experimentally in Asphaltic Concrete Resurfacing

ON hearing that powdered rubber was being tried as an admixture with bituminous concrete in Akron, Ohio, the editors of ROADS & STREETS wrote Marvin L. Davis, the city's director of public works. His reply follows:

The use of powdered rubber as an admixture to asphaltic concrete was tried out in Akron in 1947. These test sections showed sufficient promise to justify further tests and during October, 1948, we resurfaced a portion of Exchange Street, between Broadway and Maple Streets. This section of Exchange Street is approximately one mile long and subjected to very heavy traffic.

The original surface was brick, laid about 1920. After irregularities were leveled out, a binder course of 1½ in. and a wearing or surface course of 1½ in. was laid.

To take full advantage of changes in street grades, one half of the street was laid with the rubber additive; our standard Ohio T-35 specification asphalt on the remainder. This, we expect, will give us as near ideal condition as possible for observation and comparison.

The rubber powder was Government Standard (GR-S), and was 40 mesh and finer. Two percentages of rubber were used, 5% and 7½%, based on the weight of asphalt. The asphalt was heated to approximately 300° F and the rubber powder was sifted in slowly with agitation and mixed for about 2 hours. From this point, transportation to job site and application are standard procedure.

During the heating and mixing, the rubber swells and becomes dispersed in the asphalt. The addition of rubber to the asphalt raises the softening point and lowers the penetration. This increases its ductility and water resistance, and thereby makes the asphalt less sensitive to temperature changes.

The idea for rubber pavements originated in England and Holland, and attracted the attention of P. W. Litchfield, chairman of the Goodyear Tire and Rubber Company. Under his instructions, Goodyear's research department developed the procedure followed in Akron's test sections. The mixing, handling, and laying were done by The Thorpe Construction Company under contract with the City of Akron. Work done under the supervision of I. G. Schmidt, highway engineer, and R. E. Willems, engineer, highway maintenance.

This project will be watched very closely and will serve as a guide in our future work. If it comes up to our expectations, we believe it will be a distinct improvement in "wearing course" materials, at a reasonable cost.

You appreciate that we are unable at this time to make definite statements as to the benefits of the "powdered rubber" additive. We believe it will increase the life of the pavement and reduce maintenance costs. Since the rubber powder is not being produced on a commercial basis, we do not have data to estimate the added cost, although this added cost should not exceed 10c per sq. yd. (1½ in. thick) for the "wearing course."

(*Continued from page* 81)

dumping . . . Sidewalk plowing still imposes a multiplicity of problems, equipment being generally too wide and legal problems of property owner cooperation varying in different cities.

Airports: City officials are still concerned primarily with financing and administrative problems . . . Runways for big planes are not a problem of the future but are needed now, and meeting heavy wheel load requirements is often a serious and costly problem, due to adverse soils and other conditions existing at the present airport sites . . . Suggestion was made to zone municipal fields for light and heavy craft, providing one runway and related paving for very heavy planes . . . Sod type runways should not be overlooked as an economy in handling private planes . . . Problem of putting municipally-owned private flying fields on non-losing basis still unsolved in many cities, with various bases of payment being tried for holding competent managers . . . Officials of small cities should be realistic about private fields, said one spokesman; these fields, when turned over to cities as war surplus, can be made to pay handsome profits, countered another.

Street Construction and Layout: Great variation still exists in design of suburban streets, as to paved width, type of curb, location and width of sidewalks, details of driveway turnins. Low rolled concrete curb is favored. Curbless paving not favored, as city-type drainage must be provided, which means channeling storm water into inlets; and because street sweepers commonly work along gutters . . . Walk elevations in relation to gutters must be watched, to accommodate modern low-slung automobiles into driveways . . . Some cities are trying the idea of a continuous gutter with curb roll carried through each suburban block, the curb being reduced in height but not altogether eliminated across driveway entrances—helps appearances and simplifies construction.

Acme

★ Raking and rolling for final touches to an intersection on the Akron experiment. Thorpe Construction Co., contractor. Pouring the rubber powder in the hot asphalt, after which it is thoroughly mixed in.

Closing the Gap Between Research and Practice

By C. A. Hogentogler, C.E.

Continuing comment and discussion received by the Editors, arising from Mr. Hogentogler's recent articles

Engineers Are Not Supposed To Be Guessers

By W. J. Arndt, C.E.

Assistant Engineer of Materials, State Highway Commission of Kansas, Topeka

IN the November issue of ROADS AND STREETS a Mr. Troy Carmichael, a member of the American Society of Civil Engineers, set forth a rather lengthy comment on C. A. Hogentogler's September article entitled "More About Mathematical Theory and Research Data."

Now, there is nothing startling or abnormal about one engineer commenting or discussing an article written by another engineer. In fact, it is usually a very enlightening practice and gives the readers various viewpoints on a given subject or problem.

Neither is there anything unusual or abnormal if the one commenting on another's work seriously disagrees with that person's methods and even goes so far as to vigorously oppose such a solution.

But it is abnormal when the comment or discussion departs from a dignified and professional plane of opposition. It is this unusual presentation of opposition that prompts the writer to add his comments to this discussion.

Ideas Much Needed

The engineering profession is certainly not oversupplied with too many progressive and modern ideas, especially in the construction of highways and airports. Of all of the phases of engineering, undoubtedly highway engineering has had the fewest real innovations of major importance—the mechanical engineers have made great strides in the field of refrigeration and diesel engines, to mention only a few. The radio and electrical engineers have progressed far in the last 20 years; if you don't believe it, how about the many uses of the photo-electric cell, radio, or television?

Did this progress come from throwing all mathematics, theory of electrons, and an advancing knowledge of gases, ventilation, and chemistry out of the window and say, "I'll just use common sense"? Of course, the negative answer is obvious.

To make such strides they assembled and absorbed all of the sound theory that they could find available. THEN, using their very best judgment and with the aid of *intricate mathematics* they created new and better trains for us to ride on, better ventilated and air-conditioned homes and offices to spend some hours in, and better refrigeration for our better foods. Mind you—I haven't touched on Atomic Power, but I'll dare you to apply the Carmichael Formula to that one.

Should Solve Indeterminates

Now, there is no real quarrel with Mr. Carmichael's desire to have COMMON SENSE be a good influence in engineering matters. COMMON SENSE is a good ingredient to have in any matter, whether you are eating, working, playing or exercising. But it alone, even with 10, 40, or even 60 years' experience, will not suffice. And besides, the poor young engineer has to start some place and he may not have such a delicate balance of COMMON SENSE so as to always be right. The chances are that without guides he would never come up with the right answer.

The disturbing feature about Mr. Carmichael's ridicule of those men who have tried to assist all engineers to more accurately evaluate each problem which they face, lies in the inference that one should not make an effort in the solution of the many indeterminates which exist to-day in the field of highway and airport engineering.

I give Messrs. Hogentogler, Goldbeck, Clemmer, Older and all of the others an unlimited quantity of praise and gratitude for *trying* to assist in engineering progress. Even though most of us know differently, let us assume that practically all of their work was inaccurate, incomplete and wrong. They at least made an *effort*. If their work was wrong it would soon be made self-evident. However, on the contrary most of it has been proven to be of very great value, and we should be thankful that they were interested enough in their work to put in long hours of thinking, studying and working in order to progress.

Now, neither do I have any quarrel with Mr. Carmichael's suggestion that all we need to do is to refer to the manuals and handbooks issued by the Asphalt Institute. In fact, I have a reference library containing practically all that this organization has published, and find them quite useful. Their latest publication which I have which deals with the design of highways and airports, among other useful information, is entitled "Asphalt Handbook"—Construction Series No. 81 dated November, 1947.

They begin their exploration into Chapter IX entitled "Design of Asphalt Pavements for Highways and Airports" with a section called "Basic Considerations." In this section this statement is made: "Probably the greatest single advancement in the building of modern pavement is the development of the science of soil mechanics." They then go into an accurate discussion of densities, Optimum Moistures, Plastic Limits, Liquid Limits, Plasticity Index and Classification of Subgrade Soils as A-1, A-2, A-5, A-6, etc., and state "one of the best known (methods of soil classification) is that developed by the U. S. Public Roads Administration." Their entire system of the design of Asphalt Pavements is based on all of these factors.

Now, who does Mr. Carmichael suspect played a leading role in the development of the basic considerations of pavement design used by the Asphalt Institute, and which is also used by most other highway engineers throughout the country? None other

than that bad man who made engineering too complicated for Mr. Carmichael, C. A. Hogentogler, C. E.

Need More Such Men

It seems to me that real engineers owe it to themselves to encourage such progressive thinking and such willingness to attempt to help out a none-too-scientific minded group of would-be promoters of civilzation as highway engineers are supposed to be. We need more men such as Goldbeck, Clemmer, Porter, Hogentogler and all of the others who are making an effort to learn why certain kinds of roads behave badly while others behave well. We, of all the groups of engineers, are working with the greatest number of unstandardized materials, such as soils, sands, stones—yes, and asphalts, cements, too. All of these materials have room for better and better understanding and improvement. We, as highway engineers, have to overcome constantly changing traffic, both in quantity and in size. We have to overcome, as do no other group, the ravages of climate, heat, cold, rain, and sunshine as well as the traffic. Are these reasons why we should not pay any attention to information provided for us by those who are trying in their way to help us figure out how to make a road or airport function satisfactorily, yet be built with the most economy?

Lincoln Steffens states in his book, "*Lincoln Steffens Speaks*"

> "That nothing is done finally and right
> That nothing is known, positively and completely."

And he is very correct. Even the best we can do with all of the testing tools and information we can get together is not going to be good enough. We can, however, do the best we can. And it won't be done by GUESSING. There are far too many glaring examples of a waste of the taxpayer's money as a result of guessing. Because the omission by one person of one single factor in his guess, even if his guess is a good one, will give him a black mark.

On the other hand, even if a certain formula is not positively, exactly correct, it has set down certain things or factors which the engineer should be considering in his thinking.

Consider Every Factor

Probably the reason why it fails to provide the *exact* answer is because one or more factors have been neglected or omitted. It is never the case of considering too many factors.

Every engineer will find a stretch of road here or there on occasions which seem to function well and successfully under circumstances of a very unfavorable nature. But for every one of those he also has six or seven that should be functioning properly but which for some reason or other are not going to attain their normal expectancy.

Of course, one of the failings of the highway or airport engineer lies in the fact that if his original design fails to hold up, it can always be turned over to the maintnance group. Then the story is—the maintenance cost on that piece of road is rather high. That is not good engineering. Good engineering consists, among other things, of providing the public with a relatively permanent, good riding surface within sound economic costs for the traffic involved. Guessing, even with the best of COMMON SENSE and lots of EXPERIENCE, will not consistently fulfill that requirement of GOOD engineering. There will be plenty of maintaining to be done on our highways and airports even after the best possible job has been done in the preliminary engineering, the design, and the construction.

It was not the purpose of this short explosion to come to the defense of any one of the gentlemen mentioned by Mr. Carmichael. Their own records stand up for them. But Mr. Carmichael, in his comments in ROADS AND STREETS in November made many unjust remarks on works which were intendeds as aids to other engineers. I insist that the highway engineers of today need more help than ever before and that it isn't coming fast enough nor full enough. During the war, practically all research work stopped. It should now begin on a larger scale with greater scope. A positive attack, on finding out how things can be done better and with the minimum opportunity of failure, is far better than the negative approach of stating that all research literature should be taken with a grain of salt and let's get back to guessing.

I hope that Mr. Carmichael wrote his article with the intent of amusing the readers (since it was very cleverly presented) and not with the intent, as was gleaned by the writer, of ridiculing the work of men who have put forth an *effort* in *trying* to add to engineering knowledge.

1500 Registration Seen for Distributor Convention Jan. 16-20

REGISTRATIONS closed on November 15 for the 1949 AED 30th Annual Meeting, indicating an expected attendance in excess of 1,500 distributor and manufacturer members in the construction equipment industry.

Program for the five day Convention, to be held at the Stevens Hotel, Jan. 16 to 20, has been designed to meet the needs of all members. Sound business guidance and the profit of mutual discussion and new contacts have been combined with a well-rounded schedule of social functions.

Opening event on Sunday, January 16, will be the second Local Association Round-Table, featuring open discussions led by a panel of veteran distributor members. Discussion will deal with all phases of local association organization, operation, membership and activities.

First feature on Monday morning will be the Early Birds' Breakfast, sponsored by the Westerners from Region XI, in honor of the out-going president. Following will be the distributors' business session which will include reports on vital issues in the industry and of prime concern to every member. New members of AED will be feted at the noon luncheon, which will feature a top-notch speaker. A committee forum session, with attendance limited to distributor members, will follow the luncheon. The President's Cocktail Party is slated for the beginning of the evening's entertainment.

On Tuesday the blue-ribbon innovation of the 1949 convention program has been planned, No business sessions or luncheons have been scheduled for the entire day in order that distributor and manufacturer members may meet to discuss specific subjects of mutual concern. The fact that all member companies will be headquartered at the Stevens this year insures an opportunity for more individual contacts between distributor and manufacturer than ever before, and makes this plan a "natural." The Annual Birthday Party will be held Tuesday night.

The active distributor members' morning session convenes on Wednesday, to be followed by the election of officers for 1949. An open forum with a six-man panel and moderator is on tap to consider those problems which are being faced today by every construction equipment distributor. Members and ladies are invited to the Installation Luncheon at which time the men who will lead AED during the forthcoming year will be officially installed in office.

What Does the Highway Program Mean in SAFETY?

Based on Comments at Joint Session, Traffic Engineering and Accident Records Committees, 36th National Safety Congress and Exposition, Chicago, Illinois, Oct. 20, 1948

By Roy E. Jorgensen
Deputy Commissioner and Chief Engineer
Connecticut State Highway Department,
Hartford

R. E. Jorgensen

WE highway engineers and other sponsors of a big road improvement program are fully aware of the public consciousness of motor vehicle accidents and the importance of tying our road programs to safety. In presenting our programs—in demonstrating the need of them—we stress the fact that present day traffic on our obsolete highway systems is a factor contributing greatly to the deaths, injuries and property damage from motor accidents. We mention narrow bridges, sharp curves and steep grades. But, in my opinion, we are missing the boat in not taking more positive steps toward the presentation of our program in terms of what it can mean in accident reduction.

What will our highway program really do toward safety? Say we propose to spend $100 millions on a modernization program. What kind of a return may we expect in spared lives, in reduced numbers of injuries and in savings in property damage? What will be the potential accident reduction from the widened bridges? What will be the life-saving value of the limited access express highways we shall provide as alternatives to the existing, deadly, congestion-clogged highway?

Engineering Analysis Needed

We are planning this program on the basis of detailed traffic analyses and using standards of construction based on years of research in motor vehicle operation. We can readily develop for our individual projects and for our entire program the benefits that will accrue in reduced motor vehicle operating costs and saved time for the motorists. Why can we not forecast the safety values in equally assayable terms? Why must we speak of safety in our program only in general terms rather than in specific numbers of lives, injuries and dollars? The answer, in my opinion, is that we highway engineers have yet to make the same engineering approach to accident evaluations that we have to other planning problems.

When the highway engineer's accident analyses are confounded by a search for a culprit or a principal cause of an accident, the end result is opinion, not fact. As highway engineers, we are no better off than we would be with no analysis. There have been published reports of such analyses indicating that "not more than 8% of the fatal rural motor vehicle accidents are connected with highway deficiencies. . . . The figure may be as low as 2%, or lower." *Accident Facts* for 1946 pointed out that state reports indicated a highway deficiency in 7% of these fatal accidents. For 1947 the figure was 10%. The inference from these reports must be that removing highway deficiencies will not be of large importance in reducing the hazard in motor travel. This is contrary to the position we take in advocating a large program of highway improvements. These improvements we say will eliminate hazards materially, promote safety, etc. I think we are justified in making this kind of a statement. But, if we are, the state reports of accident analyses are wrong.

Accident Rates Vary

Analysis of the records for specific routes has shown notable differences in accident rates. These differences we attribute to highway deficiencies on some routes and not existing on others. The Merritt Parkway-Boston Post Road comparison in Connecticut has been widely used; and so, also, have the Arroyo Seco-city street comparisons for Los Angeles. These indicate that elimination of deficiencies in our existing road systems will make for great reductions in driving hazard and resulting accidents. They justify the safety claims we make for our road modernization program. They are, however, quite obviously not in line with the reports previously referred to; 2, 7, 8 or 10% of accidents connected with a highway deficiency.

I should like to suggest, for consideration of this group, a different approach than is now generally made in the evaluation of accident reports. The best approach to an evaluation of accidents in relation to our highways will be attained when we have a sizable number of standard-meeting highways in operation. Par accident values will be established then on these highways. For each of the traffic volume groups for which we have standards of alignment, grade, sight distance, pavement width, etc., there will be an accident frequency value based on the operating experience of the roads meeting that standard. Accidents on substandard roads in excess of the par value will be chargeable to highway deficiencies. And, presumably they will be eliminated by bringing the roads up to standard.

Until such time as we can establish par accident values, I suggest that the accident reports be analyzed to determine whether the accident would

have happened if there had been the kind of highway our standards of construction now contemplate for the conditions on the road; i.e., volume of traffic, rural or urban, mountainous, rolling, etc. We know from these standards what the road would be like if it met our established standards. The accident evaluation would simply represent a determination of whether, under those conditions, the accident would have happened.

How Analysis Works

The manner in which this sort of an analysis would work is illustrated by the following examples:

(1) About the first of August there was an accident in our state involving two vehicles which were crossing a narrow bridge. As the result of the accident an occupant in one of the vehicles lost an arm which apparently was projecting from the vehicle. Incidentally, this accident illustrates the importance to the highway engineer of not confounding the accident analysis by undue consideration of actions of the operator. In the first place, the individual who lost his arm likely would not have lost it if it had not been projecting out of the motor vehicle. Furthermore, there are indications that the driver of the vehicle had been drinking, and it is possible that this may have had something to do with the accident. However, in analyzing this accident until the procedure I propose, the actions of the occupant and the driver would not be the important factors to be considered. The important thing would be to consider the present bridge in relation to the kind of a bridge which would be provided if the road met our established standards. The present bridge provides a lateral clearance of 15 feet. Our standards for this road contemplate a lateral bridge clearance of 40 feet. Under the proposed method of analysis we should conclude that the accident would not have happened had the road met our standards. The accident, therefore, should be charged to a deficiency in the road system.

(2) We have analyzed carefully the fatal accidents on a portion of U. S. Route 1, between Bridgeport and New Haven, where the accident record has been extremely bad. It is noteworthy that under the customary procedure for analyzing accidents the greater portion of the fatalities were attributed to the individuals and not to the highway. For example, there have been numerous fatal accidents involving pedestrians, and in almost all cases the accident reports indicate that the pedestrian was at fault. Under the proposed procedure for analyzing accidents, it would be determined that our standards would call for the replacement of the existing U. S. 1 with a limited access express highway. On such a highway there would be no pedestrians. There could be no pedestrian accidents. Each of the fatal accidents involving a pedestrian would not have occurred if we had a road which met our established standards. The accidents can, therefore, and properly should, be charged up to highway deficiencies.

In discussing the accompanying article, Mr. Jorgensen wrote us, "It was most gratifying to find from your editorial 'When to Blame the Roads' in October ROADS AND STREETS *that someone else is concerned about the obvious discrepancy between the reports of accidents and the contention of highway officials regarding the safety value of highway modernization.*

"On the one hand, numerous states are preparing reports which show only a small percentage of motor vehicle accidents attributed to highway deficiencies. At the same time, those of us who are interested in seeing an expanded highway program are citing the safety values associated with modern highway construction. And, we are able to show very definitely, by before-and-after studies and by comparisons involving the few operating modern highway facilities, that safety can be built into our roads."

(3) The accident record on the Merritt Parkway, in comparison with the accident record on parallel U. S. Route 1, has been used widely to illustrate the safety value of the limited access highway construction. However, it is noteworthy that even on a highway like the Merritt Parkway certain accidents may be chargeable to highway deficiencies. Our present standards for that type of a highway contemplate somewhat higher standards than were incorporated in the Merritt Parkway, which has now been in operation ten years and was planned a number of years in advance of that. In analyzing the fatal accidents on the Merritt Parkway it has been found that over one-third of the fatalities involve the parking of motor vehicles on the traveled way. The parkway does not have a paved shoulder as is contemplated by our present standards. It is necessary for vehicles to mount a curb and park on the grass shoulder area if they are to get clear of the traffic lanes. Many operators are reluctant to drive over the curb and park on the grass. By parking their vehicles in the traffic lane they create a hazard which, as indicated above, has accounted for over one-third of the fatalities on the Merritt Parkway. Under the proposed procedure for analyzing accidents, these fatalities properly would be charged against deficiencies in the highway.

It is recognized that the accident analysis procedure being recommended involves the exercise of personal judgment in the determination of whether the accident would have happened under ideal highway conditions. However, exercise of judgment is required under the present procedures for accident analysis, and with much less restraint than would obtain under the new procedure.

The proposed procedure will not be perfect but it will provide the kind of highway evaluation of accidents that we need. It will give us a better measure of what our road modernization program is worth in the provision of safety. And we shall be able to quit talking safety in generalities and start to spell it out in lives saved, injuries avoided, etc.

Highway Officials Announce National Essay Contest

As a means of interesting junior civil engineering students as well as faculty members in the various engineering colleges and universities in the opportunities for a career in highway engineering, the American Association of State Highway Officials has inaugurated a national essay contest.

This step was taken at the recent Salt Lake City meeting of the AASHO following the startling disclosure from a national survey of the extremely low interest shown in highway work by engineering college students today. Also, by the serious personnel situation in the highway departments, many of which have failed to properly sell the many advantages of a career in highway engineering.

The contest closes March 1, 1949, and winners will be announced the following June.

The contest is divided into two divisions: Faculty Member, and Student Division. A winner will be selected from each. The award is an all-expense trip to the 35th annual meeting of the AASHO in San Antonio, Texas, in October, 1949. At that time, the winners will present their papers before a general session of the annual meeting.

It is realized by the highway officials that such a contest is not, by any stretch of the imagination, a complete answer to the problem. It is hoped, however, that the contest may

(*Continued on page* 90)

EQUIPMENT MAINTENANCE

Keeping 600 Units Serviced & Repaired at Limestone

★ In addition to two tire-removal crews, one crew does nothing but check tire pressures all day, going from rig to rig or waiting alongside the haul routes with a truck-mounted compressor

HOW the contractors and army engineers have gone about building that much-talked-of new home for B-36's up in Northern Maine was described in Nov. '48 R&S. It has indeed been a "show," and the hustle and bustle on this job is remindful of war days when men and machines "poured it on."

Here are a few additional photos from this large and interesting project, showing something of how the shop and servicing work were performed during 1948. As noted in the November article, the 600 or more major machines—employed in the grading, drainage, quarrying, pit work, paving and building construction—were kept rolling by a staff of 240 (more or less) mechanics, helpers and specialty men. Superintendent John Coburn, a veteran employee of Lane Construction Corp., directed this vital work. This firm and T. W. Cunningham, Inc., are joint contractors on the project.

Under Coburn were 3 equipment managers—one each for shop and field

★ John Coburn, superintendent of equipment, boss of a 240-man service and repair crew

★ Steam cleaning saved a lot of time and labor at Limestone, cut the unit cost of repairs, and insured better work. Jenny "Hypressure" equipment shown

★ Equipment waiting in the yard—for repairs, shipping out, or just on call. Over 600 major equipment units were in use through most of the 1948 summer at Limestone

★ Rodgers Hydraulic track pin press and power bolt wrench are housed in this shack, which opens onto the shop yard

★ Ten welding outfits and 14 field repair trucks helped keep the fleet in operation

★ Field shop truck, a la U.S. Navy, rigged up for welding, cutting and drilling steel and performing other emergency field jobs

★ Headquarters of the motor pool, with seven bays for repairing trucks. These include one indoor and one outdoor bay with ramp over pit

in daytime, and one over-all on the night shift. There were 2 master mechanics and 2 assistants on each shift, plus mechanics, helpers, oilers, greasers, tire crews, etc.

Servicing was done in the field on a "catch 'em" basis rather than through a formal lunch-time or shift-change line-up, due to the constantly varied and changing operations scattered over several square miles. Most oil changing, however, was done at night and as much as possible of the greasing. Oil filters and air cleaners were changed every 20 hours. Other detailed

★ Lubricants—delivered and consumed by the carload. Last winter it got so cold that No. 10 oil wouldn't flow, and grease was stiff as rubber. Much experimenting was necessary to keep the equipment rolling at 40-below

★ This husky ten-wheel wrecker can cross soft ground and pick up just about anything used on this project (except, of course, the 200-ton super-compactor)

★ Hardfacing grizzly bars—done in shed adjacent to the crusher

★ Left: Front of the big field shop, moved in sections from another airfield in the Northeast. Right: Five heavy-duty grease trucks with high and low pressure lube lines are in use at Limestone, along with 32 trailer-mounted flood light outfits. The latter are gasoline-engine-powered, and each carries four 4000-watt floods, mounted on telescoping standards

attention "followed the book" and, while perhaps done informally, routine tasks were performed on a positive check-off basis.

Field equipment included five grease trucks with high and low pressure lube lines; two oil supply trucks for field and yard; two tire trucks with compressors and tire-lifting equipment; one special tire truck with a crane for lifting off big scraper tires; one wrecker for bringing in broken-down equipment; several trailers for moving heavy equipment. Over 1700 tires were in service as of Aug. 1.

Trucks on this job numbered some 175, and most were 10-ton and heavier dumps, employed on base gravel and stone for the runway. Dump trucks were serviced in a 6-bay layout, five bays being under roof. Two of the bays included a ramp and platform for speeding up the servicing of the heaviest dump trucks.

The main shop is a 120 x 160 ft. wood building designed for easy taking apart and moving. Complete overhauling facilities were installed, and the shop floor area divided into zones respectively for handling trucks, tractors, scrapers, graders and other major equipment types. During the open part of the year (June to October) much outdoor repair work was done on shovels, cranes and other big stuff.

This is no "fancy Dan" place, yet the repair work has been so mechanized and expedited that a remarkably small percentage of the total outfit was down at any one time during the working season.

California Budgets $87,000,000 for Roads

FRUITS of Governor Warren's vigorous and successful fight in the 1947 special session of the California legislature, for passage of the Collier-Burns Act increasing the gasoline tax, are reflected in a new enlarged budget for California highway work in the 1949-50 fiscal year, beginning next July 1.

The state highway budget for the 1949-50 fiscal year, made public by director of public works C. H. Purcell, chairman of the commission, includes $69,703,000 worth of major construction projects, this figure including engineering costs.

In addition, the commission budgeted $17,701,500 for acquisition of right-of-way for projects contemplated in the 1950-51 program.

The totals compare with $54,006,000 budgeted for 1948-49 construction work.

The program of jobs laid out for the coming year includes work in 55 of California's 58 counties. "In preparing the list of projects," director Purcell said, "the highway commission and division of highways engineers devoted months to a study of state highway problems and needs, and in the final analysis, selected critical deficiency projects which, in the judgment of all members of the commission, required immediate attention and action. The commission has also given serious consideration to the fact that construction costs have increased approximately 90%."

Technical Editor Wanted

The leading publication in the highway and heavy construction field, covering both engineering and contracting, has opening as field editor. Man selected must have engineering education and some practical experience plus either definite writing aptitude or writing experience. Travel about 50% of the time and be largely on his own. An exciting job with good future for right man. Tell us in a single letter why you think you might qualify and give minimum salary. Address Box 500, "Roads and Streets," 22 W. Maple Street, Chicago 10, Ill.

ENGINEERS - DESIGNERS - DRAFTSMEN - INSPECTORS

ARE YOU INTERESTED IN A JOB . .

OR

A CAREER SERVICE?

The New Jersey State Highway Department is offering PERMANENT POSITIONS to qualified men in many fields. This is not the usual job offer. This is an opportunity to become affiliated with one of the great state highway departments and take part in the most forward looking highway program in America.

PARKWAY, FREEWAY and EXPRESSWAY construction of the most advanced types offers unparalleled opportunities for acquiring experience in modern design and construction methods.

IN ADDITION, *every* position with the N. J. State Highway Department means:

1. Year 'Round Employment
2. Guaranteed Annual Increments
3. Civil Service Protection
4. Opportunities For Advancement
5. Generous Sick Leave With Full Pay
6. Two Weeks' Vacation With Pay
7. Liberal Retirement Benefits
8. Immediate Employment At Base Salary

Qualified applicants will be employed immediately pending Civil Service examination which will be held several months after employment.

The following positions are immediately available to qualified men:

Senior Bridge Designers*	$4500-5400	per	annum
Bridge Designers	4200-5100	"	"
Sr. Bridge Inspector	3600-4200	"	"
Landscape Architect	3600-4500	"	"
Asst. Engineer, Highway	3000-3600	"	"
Bridge Detailer	3000-3600	"	"
Bridge Inspector	3000-3600	"	"
Jr. Engineer, Highway	2400-3000	"	"
Jr. Engineer, Laboratory	2400-3000	"	"
Jr. Engineer, State Aid Projects	2400-3000	"	"
Asphalt Plant Inspector	2400-3000	"	"
Laboratory Technician	2160-2760	"	"
Sr. Engineer Aide	1800-2400	"	"
Materials Inspector	1560-1920	"	"
Engineering Aide	1560-1920	"	"

* Applications are also desired for Sr. Bridge Designer with experience in writing specifications.

Note: We will accept applications from qualified non-U.S. citizens on a temporary basis.

Address A. Lee Grover, Secretary, New Jersey State Highway Department, Trenton, N. J., for application blank **today.**

Charles M. Noble
State Highway Engineer

Spencer Miller, Jr.
State Highway Commissioner

(*Continued from page* 86)

contribute to a stimulation of interest on the part of engineering students and faculty members alike in the highway department personnel shortage and that this interest may lead to other steps that will, in some degree, alleviate the present distressing situation.

The Faculty Member Division shall be open to all full-time members of the civil engineering faculties of the colleges and universities presently carried on the official mailing list of the Highway Officials in their national headquarters office.

The Student Division shall be open to all full-time junior-year civil engineering students of the colleges and universities carried on the official mailing list, *provided* that such juniors are enrolled in a course of study leading to the degree of B.S. in Civil Engineering, or an equivalent degree.

The civil engineering faculty member shall submit an essay not exceeding 2,000 words in length, on the subject, "What I Advise My Students with Regard to Selecting Highway Engineering as a Career." The paper shall be an exposition of the faculty member's thinking and advice to his students with regard to their selection of highway engineering as a career.

The junior-year civil student shall submit an essay not exceeding 2,000 words in length, on the subject, "What I Think of Highway Engineering as a Career." The essay should set forth the student's knowledge of, and attitude toward, public service as a highway engineer, including an analysis of the factors, favorable or adverse, which influence him in selecting or rejecting such work.

Readers of ROADS AND STREETS who are interested in entering this contest or who would like to pass instruction forms along to acquaintances, should write to Hal H. Hale, Executive Secretary, American Association of State Highway Officials, 1220 National Press Building, Washington 4, D. C.

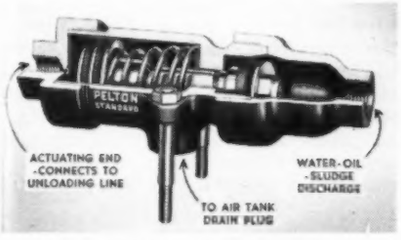
400,000 Posts

Few of us ever stop to think how many trainloads of wood posts are needed in a highway program. In Connecticut recently, someone figured that there are about 400,000 fence posts in service along the state highways. These are used mostly for guard rail and signs, but also some are for culvert markers and other purposes. In this state, most of the posts are of the newer style pressure-treated using creosote. Posts preserved in this way are expected to last more than 20 years.

New Construction Equipment and Materials

1
Moisture Ejector Valve

Monroe Standard, Inc., Galion, O., has announced the Pelton moisture ejector valve, a port and piston type unit used with both commercial vehicle air brake systems and stationary compressors to eject all water, oil and sludge from air compressor storage tanks. Valve operates

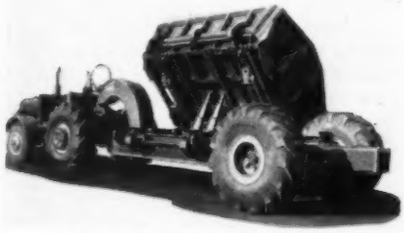


Pelton Moisture Ejector Valve

automatically each time compressor "cuts in" and "cuts out." Tank pressure furnishes the motive force. The valve is constructed of bronze and contains reinforced Neoprene cups. Self cleaning action prevents carbonization of working parts. National distribution is being handled through air brake jobbers.

2
Side-Dump Euclid

A new addition to the line of off-the-highway earth moving equipment of The Euclid Road Machinery Co., Cleveland 17, O., is the Model FDT-98W side-dump Euclid. Trailer body is of heavy welded construction for hauling rock, ore and



Model FDT-98W Side-Dump Euclid

heavy excavation; it has a payload capacity of 40,000 lb. and a struck measure capacity of 13 cu. yd. Down-folding side gates open automatically by mechanical linkage when the body is raised by the Euclid hydraulic twin hoists. Either right or left side dumping can be selected by the operator according to the job requirements. The Euclid tractor is powered by a 200 h.p. diesel engine and provides a top speed loaded of 33.4 m.p.h. Tires on drive and trailer wheels are 24.00 x 25 for good traction and flotation on soft fills and waste banks. The unit can dump the load non-stop over the bank or edge of the fill.

3
Microfilm 42-In. Camera

A new triple-purpose microfilm camera, announced by Diebold, Incorporated, 2 West 45th St., New York, N. Y., is capable of photographing copy up to 42 in. in width by any length in one continuous exposure. Its principal applications are in the microreproduction of engineering drawings, newspapers, blueprints, maps, surveys, and large production control and accounting records. A reduction ratio of 34 times, which reduces the microfilm image to less than 1/1,000 the area of the original copy, is made possible by inverting the camera so that copy passes

New Diebold 42 in. Microfilm Camera

over the lens instead of underneath it. The flow-type camera is capable of microfilming the longest copy in existence in one operation. A 100-foot roll of film can take copy up to ⅝ths of a mile in length. Through use of the enlarging feature of the camera, images can be "blown back" at reduced size, original size or larger on a single sheet or roll of paper in one printing operation. Any desired number of inexpensive contact prints can be made from the original roll of negative film. The camera when converted to a flow enlarger will print blow-ups of any desired image on photo-sensitive paper or cloth from the roll of negative film. Copy can be moved through the camera at two speeds of 30 or 60 ft. per minute. At the speed of 60 ft. per minute, a drawing 10 ft. long can be microfilmed at 10 seconds. Through a series of five buttons on the control panel, proper light intensity is controlled by the operator by merely touching the button offering the best lighting for any type of copy.

4
45-Ton Capacity Crane

A rubber-tired two-engined moto-crane, announced by Thew Shovel Co., Lorain, O., has a safe-rated capacity on outriggers of 45 tons at a 12-ft. radius. Weighing 65 tons, the new moto-crane has the following overall dimensions: length, with boom in travel position over front of carrier, 66 ft., 5 in.; width, outside to outside of tires, 11 ft., 7¾ in.; height with gantry erected, 19 ft., 5 in., and with gantry lowered, 14 ft. The moto-crane comprises two basic components. These con-

Lorain MC-820 Moto-Crane

sist of the carrier, or rubber-tired mounting, which transports the unit from place to place; and the turntable, or revolving superstructure, which is attached to the carrier frame. While the carrier is automotive in general design, it has been engineered specially to serve as a mounting for heavy-duty crane lifting service and therefore departs from the ordinary motor truck design in many respects. The moto-crane is equipped with two Waukesha diesel engines. One engine, rated at 225 h.p., furnishes power for propulsion of the carrier up to speeds of 18 miles per

For More Facts on These Products

Mail inserted card, and we'll pass your inquiry along.

Or write directly to the manufacturers or their nearest distributors, referring to this issue of Roads and Streets and the equipment mentioned.

hour. This engine is equipped with a 24-volt electric starter, generator, air cleaner, muffler, oil filter, and air compressor of 12-cu.-ft. capacity. The other engine powers the turntable mounted on the carrier. The Fuller transmission, mounted behind the engine, provides a range of 5 forward speeds and one reverse speed. Forward speeds range from 1¾ miles per hour to 18 miles per hour. Corresponding gradeabilities for the unit, based on use on dry concrete road surface, range from 2.3 per cent to 37 per cent. A 29 per cent grade may be climbed in reverse. Mounted behind the 5-speed transmission is a Timken-Detroit power divider from which equally divided power is transmitted by separate propeller shafts to each of the two driving rear axles.

5

Angle Dozer

A new angle dozer, produced and distributed by Central Mine Supply Co., Mount Vernon, Ill., is only 3½ ft. in height, with an overall length of 7 ft. Powered by a gasoline engine, it has three speeds forward and reverse, and a six-foot turning radius. It has a special tilting front axle and hydraulic-powered front wheel. The steering controls, brake and clutch are hydraulically controlled separately off the pump on the main shaft. Spindles, etc. have Alemite fittings, and the wheels are rubber-tired with heavy tractor tread. The synchronized right

"Handy Andy" Angle Dozer

headlight turns with the front wheels, and a black line on this light indicates the position of the wheels to the operator at all times.

6

FWD Truck

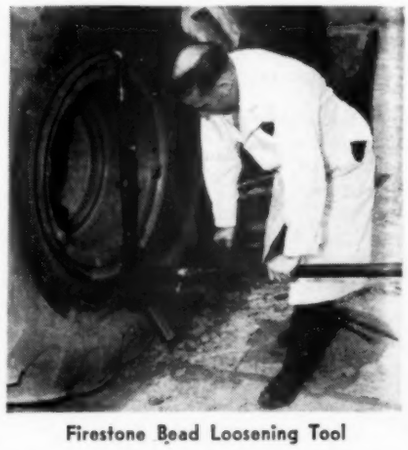
Another model, the YU, has been returned to the line of FWD trucks of The Four Wheel Drive Auto Co., Clintonville, Wis. A standard model before the war, the YU, rated at 28,000 lb. gross vehicle weight, has been entirely redesigned in accordance with the FWD program of advance engineering development. Refinements incorporated in the new model YU provide greater driver comfort, greater ease of driving, greater serviceability and greater adaptability to a wide variety of applications, the company claims. The new model YU features a 142 h.p. motor, rated at 2250 r.p.m. Torque of the motor is 425 foot pounds. A standard wheelbase of 150 in. is listed with options up to 182 in. and body space back of the cab from 121 to 190 in. The five speed transmission contains helical gears in all forward speeds for quieter operation, easier shifting and greater strength. Spiral-bevel ring gears and pinions are provided in both front and rear axles.

Model YU Equipped with 5-6 yd. Dump Body

7

Bead Loosening Tool

A new bead loosening tool that will exert a concentrated pressure up to 10,000 lbs. per square inch, and makes possible on-the-job changes of giant earth mover tires has been developed by engineers of The Firestone Tire and Rubber Co., Akron, O. The new Firestone tool, adjustable for use on 20 to 33 in. rim sizes, is compact in design and can be included with other mechanical maintenance tools in the field.



Firestone Bead Loosening Tool

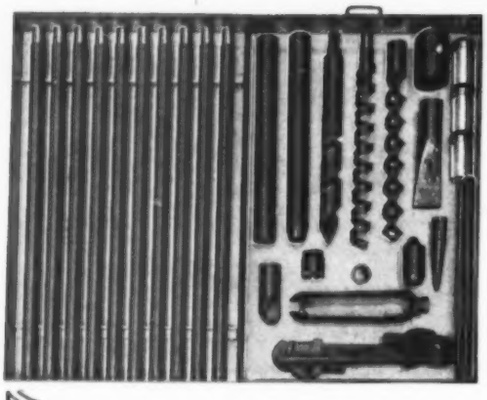
It is stated that in a matter of minutes, one man, using the tool can easily force the steel fingers between the tire bead and the rim flange by means of a long lever arm. A mechanical screw, operated by a ratchet lever, then exerts up to five tons of pressure on the bead through the tapered fingers to force the bead away from the bead seat. The tool can be operated in either a horizontal or vertical position. It will loosen the outside bead of the tire while the tire is on the vehicle.

8

Seven Jeep Implements

Seven newly designed implements for use with the 4-wheel drive jeep have been announced by Newgren Co., Butler, Pa. The line includes the Rogers "Sno-Dozer." This has a choice of 5-ft. or 6-ft. blade of 24-in. depth. It has a hydraulic down pressure adjustable up to 500 lb. Other implements are a lift-type terracing blade; a lift-type 6-cu.-ft. scoop; an earth mover capable of handling 1 cu. yd. at speeds up to 25 miles per hour; a lift-type mover available in 6-ft. or 7-ft. cutter bar

SOIL SAMPLING KIT



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CAN BE CARRIED IN ANY AUTOMOBILE

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ACCURATE SAMPLES OF EARTH AND SOIL MATERIALS

Thirty years' experience has proved these tools will recover accurate samples from practically all earth materials.

MANY USES include aluminum silicate deposits—brick and clay materials—foundation test borings—gold bearing sands—kaolin and clay for ceramics—sand and gravel pits—subgrade testing for highways and airfield runways—base materials.

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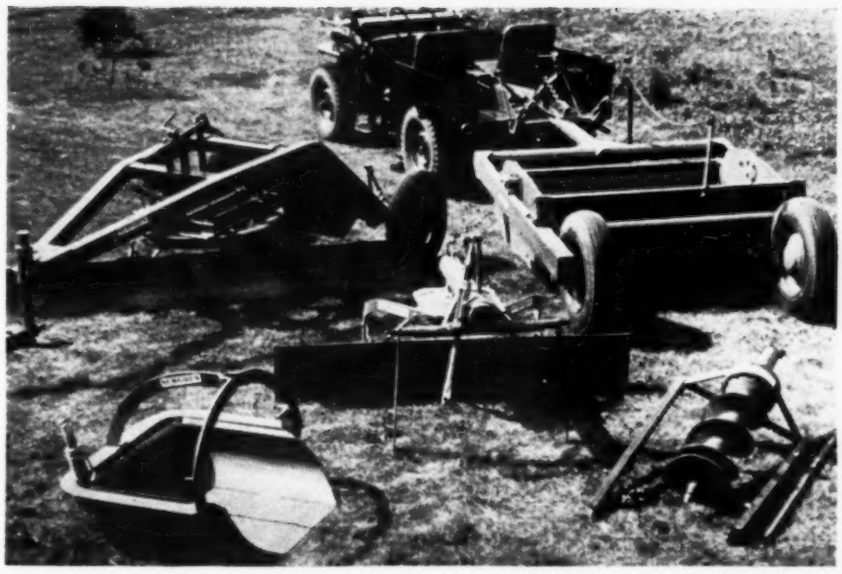
lengths; a lift-type post hole digger powered from the jeep power take-off; and a hydro grader and terracer. These implements are especially engineered for use with jeeps equipped with the recently-developed Monroe hydraulic lift. The hydraulic lift, manufactured by the Monroe Auto Equipment Co., Monroe, Mich., provides finger-tip control to raise or lower implements, and down pressure on implements adjustable up to 500 lb. Another feature is that the implements can be attached to the lift or detached in only a minute.

9
Luminaire

A revolutionary new luminaire equipped with a built-in photoelectric control which responds to changes in the prevailing light level and turns the lamp on and off as conditions of visibility demand, has been announced by General Electric's Lighting and Rectifier Divisions, Schenectady, N. Y. The new Form 110 luminaire, which has a standard optical system and mountings, is especially designed for residential, suburban, and traffic circle lighting. The photoelectric control, an integral part of the luminaire, is mounted under a standard glass meter housing in the top half of a slip-fitter-type, die-cast aluminum hood.

10
Liquid Gear Shield

A new liquid gear shield marketed under the trade name Penn Drake Gearteck by Pennsylvania Refining Co., 2686 Lisbon Road, Cleveland, O., is claimed to properly lubricate exposed, open and partially enclosed gears. It is also claimed to be a perfect lubricant for ways, slides, wire ropes, cables and dipper sticks, as well as the swing-circular rack teeth and dipper handle racks of excavation and industrial machinery, hoists, earth-moving and construction equipment. Being liquid, Gearteck can be applied easily and quickly with a brush or swab, or may be poured from container directly on the gears. Heating prior to application is not required. Gearteck promptly sets to an almost dry film, according to the maker, thus minimizing attraction of grit, dust and dirt. It is extremely adhesive and will not throw-off the gears even at high speeds.



Five of the Newgren Line of Implements. Attached to the jeep is the all-purpose earth mover. The 6 cu. ft. scoop and the post hole digger are in the foreground, the lift-type terracing blade in the center, and the hydro-grader and terracer at the upper left.

11
All-Wheel-Drive Trucks

A new line of heavy-duty all-wheel-drive converted Ford trucks, identified as the Q series, has been announced by Marmon-

GREATER YARDAGE!
LOWER COST!

WELLMAN *Williams*
WELDED BUCKETS

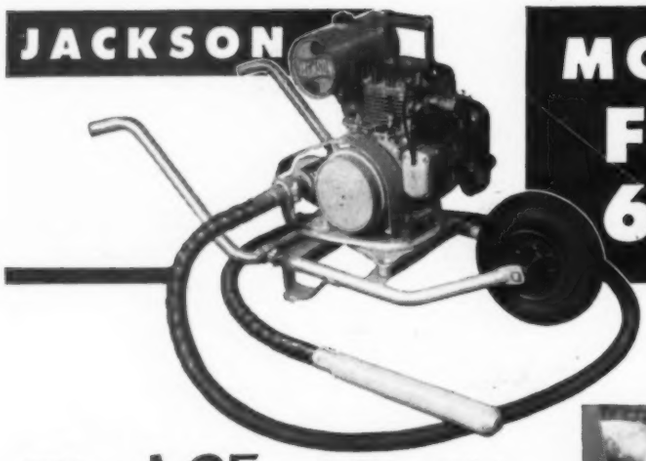
Wellman Buckets cost less to maintain because they are ruggedly built. They deliver bigger payloads because they are properly designed. The superior engineering in Wellman Buckets gives the operator better balance, easier handling, cleaner digging. Wellman pioneered the unique construction that pays off in greater yardage at lower costs. There's a Wellman Bucket for every service.

SEND FOR BULLETIN

THE WELLMAN ENGINEERING COMPANY
7003 CENTRAL AVENUE CLEVELAND 4, OHIO

JACKSON

MODEL FS-6A

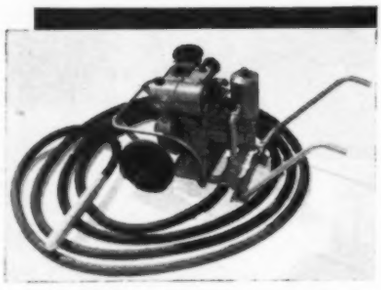


The ACE of Flexible-shaft Concrete Vibrators

Compact — powerful (4.2 H.P.) — built to take the rough and tumble of constant use with a minimum of maintenance. Gas-engine driven — an independent unit ready to go to work anytime, anywhere. Available with vibrator heads in three sizes and flexible shafting in 7' and 14' lengths up to 28'. Frequency is instantly adjustable. The FS-6A is an excellent machine for vibrating concrete on all manner of general construction. Quickly convertible to wet or dry grinding and drilling. Write for complete details.

THE BEST VIBRATOR FOR EVERY TYPE OF CONCRETE PLACEMENT!

Internal and external types — for thin sections to mass concrete construction — highway, airport and municipal paving — product manufacture. See them at your Jackson distributor or write for literature and our recommendation for any particular type of job.



Model FS-7A. Flexible Shaft, Electric. Ideal for decks, thin walls, and with short shafts for spud work.

MODEL HS-A4, HYDRAULIC

Gas-engine driven, (5 H.P.). Its 50' reach is highly convenient and a real time saver!

MUNICIPAL PAVING UNIT

Manually guided vibratory paving machine and portable power plant. Easily places upward of 65 Cu. yards of stiff mix concrete per hour. Undercuts at side forms. Strikes off to crowns, regular and inverted; works right around manholes and other obstructions.

ELECTRIC TAMPER & EQUIPMENT CO., Ludington, Mich.

Herrington Co., Inc., Indianapolis, Ind. There are six models in the new "Q" Series. Three models are 4-wheel-drive, three models 6-wheel-drive. Gross vehicle weight for 4-wheel-drive models is 21,500 lbs., for 6-wheel-drive models 35,000 lbs. Wheelbases range from 136½ in. to 220 in. In building the "Q" Series, Marmon-Herrington starts with standard Ford F-7 models. Recently introduced these models have a normal gross vehicle weight of 19,000 lb. and are powered by Ford's new 145 HP V-8 engine.

12

Impact Tool

A new and heavier model of its all-purpose electric impact tool, announced by Ingersol-Rand Co., 11 Broadway, New York, N. Y., is stated to be useful for machinery maintenance as well as construction work. With standard accessories, the new model is rated to run and remove nuts up to ⅝ in. thread size, drive

8U Impact Tool

and remove studs, extract broken cap screws and studs, apply and remove machine screws of all kinds, run wire brushes, drill steel, brick, and masonry, tap and ream. It may also be used for woodboring. Known as the 8U, the tool has all the features and advantages that have made its prototype so popular for light maintenance and production work. The reversible motor makes it as easy to remove screws, studs, and nuts as to apply them; motor burn-out is eliminated, even if the spindle stalls completely; the impact principle operates whenever resistance is met and provides extra power to push through the job. Virtually no torque reaction is transmitted to the operator under any condition.

13

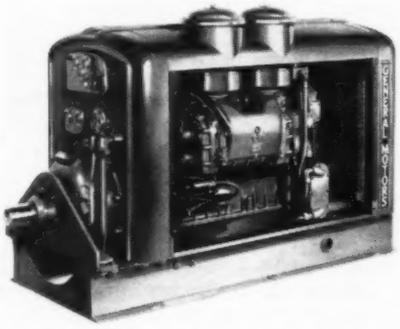
Shaft Box to Cut Truck Vibrations

Development of an improved type of rubber-cushioned propeller shaft box designed to absorb destructive vibrations occurring in trucks and buses operating at high speeds has been announced by SKF Industries, Inc., Philadelphia, Pa. The device, which supports the shaft joining the transmission to the rear axle, consists of a housing whose outer and inner rings are separated by an oil-resistant rubber "cushion" and a self-aligning ball bearing free to move lengthwise in the shaft box. The rubber "cushion" is "shot" between the two rings of the housing at

high velocity. The rubber is held in place by mechanical friction, thus eliminating the need for vulcanizing. A metal labyrinth seal protects the bearing against dirt, dust and road splash.

14
Torque Converter and Fluid Coupling Unit

A torque converter and fluid coupling unit specifically engineered to the General Motors Series 71, 2-cycle, diesel engine, has been announced by Detroit Diesel Engine Division of General Motors Corporation, Detroit, Mich. Consisting of



6-Cylinder General Motors Series 71 diesel engine-torque Converter Unit rated at 153 BHP at 1800 r.p.m.

four major elements — a pump, turbine, and two stators—the unit produces torque multiplication of up to 4 to 1. Consistent with the General Motors idea of offering powerful industrial diesel engines of small size and light weight, easily adaptable to a wide range of contracting and road building machinery, this General Motors engine-torque converter unit has been designed into an extremely compact package. The complete integrated power plant actually occupies no more space than the same engine equipped with the conventional clutch and power take off. This accomplishment has been made possible by employing the flywheel as a working component of the torque converter assembly. The unit combines the features and advantages of both torque converters and fluid couplings. Outstanding characteristic is its ability to pick up load with maximum lifting power and shift automatically from torque converter to fluid coupling principle in the higher speed range. The new engine-torque converter combination is made available by Detroit Diesel in the Single 3, Single 4, Single 6, Twin 4 and Twin 6 Series 71 models having engine ratings ranging from 75 to 300 h.p.

15
Brake Relining Equipment

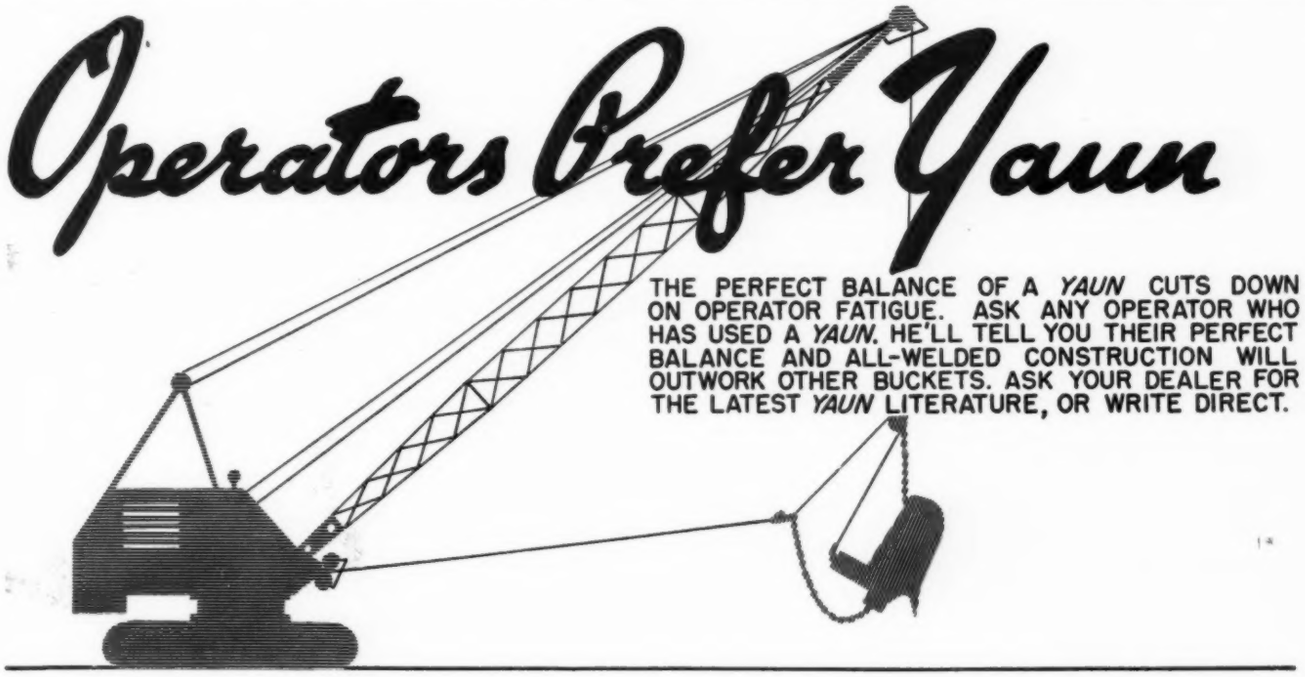
The Replacement Sales Department of the United States Asbestos Division of Raybestos-Manhattan, Inc., Manheim, Pa., has announced the addition of an industrial hand riveter to its line of brake relining equipment. It is used for riveting brake linings to brake bands and brake shoes, either internal or external type such as used on shovels, cranes, drag lines and other heavy duty industrial machinery. Suitable for handling linings up to 10 in. in width, using No. 7, No. 8 or No. 10 series tubular rivets, it easily handles any length rivet up to 2 in. long, yet is so compact it easily fits into a metal case measuring approximately 12 in. long, 6 in. deep and 3 in. high. The riveter and carrying case comes equipped with 3/16 in. and ¼ in. roll sets, ⅜ in. and ½ in. anvils, 3/16 in. and ¼ in. drills, ⅜ in. x 3/16 in., ½ in. x 3/16 in., and ½ in. x ¼ in. counterbores fitted with depth gauges to control depth of countersink, 6 "C" clamps and 1 wrench.

16
Bottom-Dump Trailer Wagon

Introduced at the Road Show in Chicago recently where it drew widespread attention from the off-the-highway hauling industry, the Model 38FDT Bottom-Dump Euclid is now in production by The Euclid Road Machinery Co., Cleveland, O. Outstanding features of this latest addition to

Model 38FDT Bottom-Dump Euclid

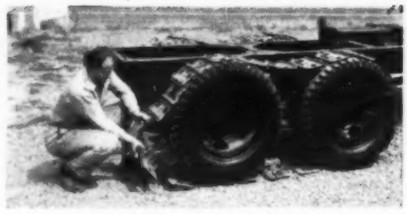
Euclid's Bottom-Dump line include a new form-fitting seat and air booster steering which give added driver comfort and reduce driver fatigue to a minimum. Large


Operators Prefer Yaun
THE PERFECT BALANCE OF A YAUN CUTS DOWN ON OPERATOR FATIGUE. ASK ANY OPERATOR WHO HAS USED A YAUN. HE'LL TELL YOU THEIR PERFECT BALANCE AND ALL-WELDED CONSTRUCTION WILL OUTWORK OTHER BUCKETS. ASK YOUR DEALER FOR THE LATEST YAUN LITERATURE, OR WRITE DIRECT.
YAUN
DRAGLINE BUCKETS AND MFG. PLANT
BATON ROUGE, LA.

24.00 x 25 tires and an improved hopper design, which places more payload weight on the drive tires, provide good traction. The wagon has a struck capacity of 13 cu. yd. and a payload capacity of 40,000 lb. The dimensions include: Wheelbase, front to drive axle, 9 ft. 5 in.; wheelbase, drive to trailer axle, 20 ft. 6⅝ in.; wheelbase, front to trailer axle, 29 ft. 11⅝ in.; length of tractor only, overall, 16 ft. 11⅝ in.; length of complete unit, overall, 38 ft. 9¾ in.; width of complete unit, overall, 10 ft. 7⅞ in.; loading height, maximum, 9 ft. 7½ in.

17
Truck Tracks

Conversion units, known as truck tracks, formerly channelled to the Armed Forces, are now available to private operators

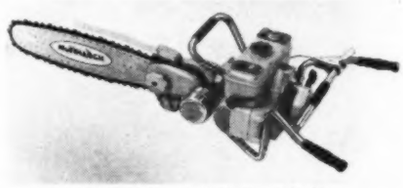


Installing Truck Tracks

through P. & G. Supply Co., 615 S.E. Market St., Portland, Ore. These tracks are stated to permit effective hauling operations under mud, snow and desert conditions which stall ordinary wheeled vehicles. The tracks may be fitted to single or tandem axle trucks equipped with most standard dual tires. Mounting the tracks is a simple operation which takes the driver about 10 minutes. Even less time is required for removal. Pads are made of drop-forged steel alloy. Fitting is done by adding or removing pads and linkage. Every pad has a master adjustment to assure proper track tension. Connecting the pads is a cadmium-plated chain of heat-treated, high tensile steel.

18
Chain Saw

A new light-weight engine-driven chain saw, with all-purpose chain for fast ripping or cross-cutting, has been announced by McCulloch Motors Corporation, 6101 W. Century Blvd., Los Angeles, Calif. The power unit is a special McCulloch magnesium die-cast engine, with full-swivel bevel-gear transmission. The cutting unit is composed of a stainless-steel laminated



Chain Saw with 20 in. Blade

blade, available in lengths up to 5 ft., and a rip-cross chain. The saw is designed for either one-man or two-man use. The 2-cycle power unit is a completely new design, engineered by McCulloch expressly for this chain-saw application. High-pressure magnesium die-castings are used throughout, with the result that the complete engine and transmission weigh only 38 lb., although developing a full 5 h.p.

19
Trench Roller

A trench roller stated to have a per lineal inch compression equal to or exceeding that of most 10-ton rollers is the newest addition to the road building and maintenance machinery equipment of The Huber Manufacturing Co., Marion, O. Built for road widening, relocating, repair, and various types of new construction work, the machine was designed with features of particular interest to the operator. To

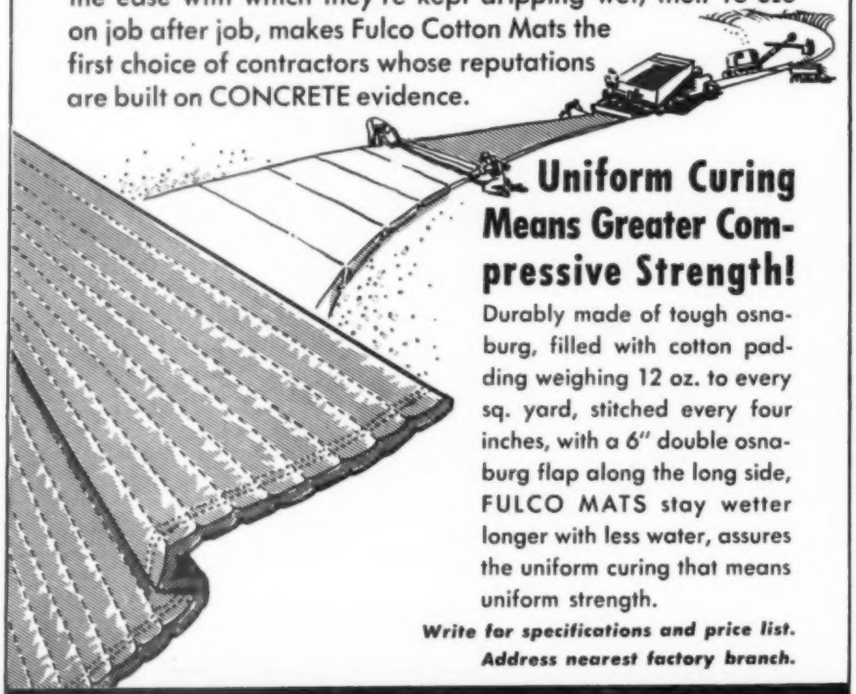
Huber Trench Roller

give the operator the advantage of facing his work at all times, the seat pivots around the steering post. Controls are simple, easy to manipulate and convenient to the operator. A hydraulic jack permits raising or lowering the outboard wheel to level the machine when working in any trench up to 13 in. The locking pin, controlled from the operator's seat, holds the adjusting wheel at the desired height. The

CONCRETE EVIDENCE:
Tougher, Smoother Roads Are Cured with
Fulco
Cotton Concrete-Curing Mats

Preferred and approved for State and Federal Highway construction, Fulco COTTON Concrete-Curing Mats assure uniform, 72-hour curing, with possibility of cracks reduced to a minimum.

Their greater insulation against sudden temperature changes, the ease with which they're kept dripping wet, their re-use on job after job, makes Fulco Cotton Mats the first choice of contractors whose reputations are built on CONCRETE evidence.



Uniform Curing Means Greater Compressive Strength!

Durably made of tough osnaburg, filled with cotton padding weighing 12 oz. to every sq. yard, stitched every four inches, with a 6" double osnaburg flap along the long side, FULCO MATS stay wetter longer with less water, assures the uniform curing that means uniform strength.

Write for specifications and price list. Address nearest factory branch.

FULTON BAG & COTTON MILLS
Manufacturers Since 1870
New Orleans · St. Louis · Dallas · Kansas City, Kans.
Denver · Atlanta · Minneapolis · New York

roller is powered by an efficient 4-cylinder, air-cooled engine. The transmission provides two speeds in both forward and reverse motion. The Huber trench roller is equipped with a brake for service and parking, a 50-gal.-capacity sprinkling tank with mats on both rolls that run in the trench, and spring tensioned scrapers on the rolls and adjusting wheel. A short wheelbase of 90 in. and a short turning radius achieved by Huber design engineers are other features of the trench roller, which is available with either a 16-in. or a 20-in. face compression roll.

MANUFACTURERS' LITERATURE

20
V-Belts

A new catalog section on its Multicord and Grommet Multi-V Belts, published by The B. F. Goodrich Co., Akron, O., pictures and describes construction of the Multi-V belts, including the Grommet V-belt and gives belt numbers, sizes and pitch lengths. One of the features of the section is a suggested procedure for designing drives using the company's Multi-V belts. The problem is outlined, step-by-step methods given and the solution of the problem revealed.

21
Hard-Facing Alloys

The new Stoody self-hardening 21 and Stoody 1027, designed primarily for hard-facing crushers, tractor parts, and heavy construction equipment are featured in a new bulletin released by Stoody Co., Whittier, Calif. The bulletin gives information on the properties, welding characteristics and sizes and prices of the two products.

22
Snow Loaders

A new 8-page folder, based on a 15-minute 16mm. sound and color movie, "Modern Snow Removal by Haiss," is now available from George Haiss Mfg. Co., Inc., 141st to 144th St. on Park Ave., New York, division of Pettibone Mulliken Corp., Chicago. The folder summarizes the story of the movie, which describes the performance of Haiss snow loaders—Model 75 WS (wheel mounted), Model 75 CS (crawler mounted) and Model 300 WS-BCS (equipped with swivel belt conveyor). Typical scenes show the difference between hand shoveling and snow removal by Haiss in a number of cities which use Haiss snow loaders. The film is available now for free showings, which will be arranged for by Haiss, upon request.

23
Crane Carriages

A new bulletin issued by Six Wheels, Inc., 1584 E. 20th St., Los Angeles, Calif., features short wheelbase crane carriages with removable rear section of frame, easily convertible from lifting crane or magnet to shovel, trenchoe or dragline. Standard dimensional data given for all models, also general specifications and other pertinent data on this new versatile Maxi, engineered for any make or model crane upper structure.

24
Hard-Facing Alloys

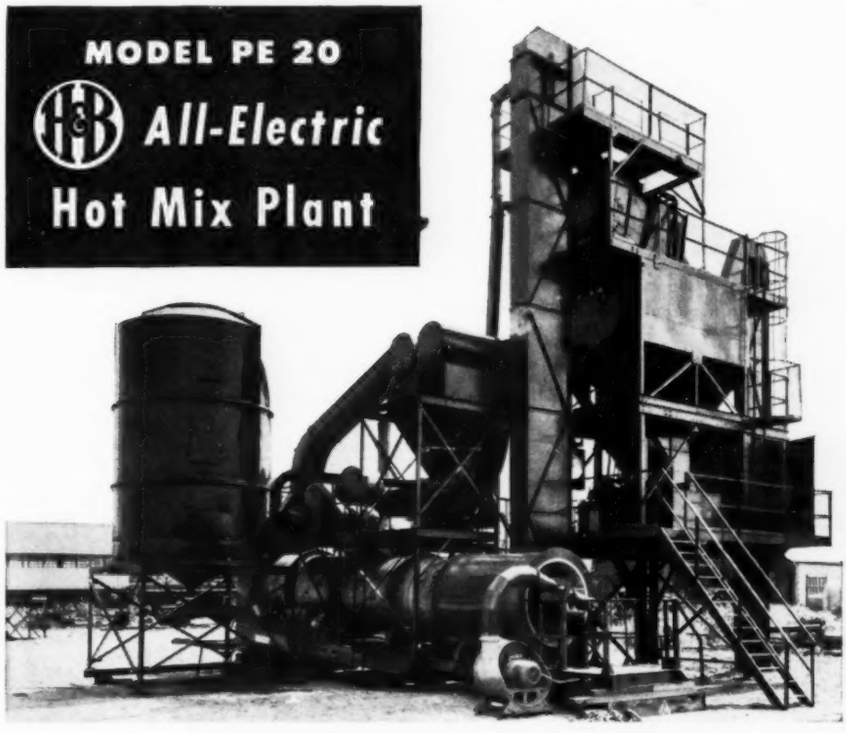
A booklet describing the hard facing of mixer arms on concrete and cinder block equipment has been issued by Wall Colmonoy Corporation, 19345 John R St., Detroit, Mich. It contains new complete information on hard facing procedures plus sketches showing exactly where to hard face the parts.

25
Earth Moving Equipment

The new "B" Tournapull and the "B" Tournadozer are described in two new broadsides issued by R. G. LeTourneau, Inc., Peoria, Ill. Broadside TP-163 lists complete specifications for the B Tournapull. An overhead cutaway diagram of the machine shows and explains its features. Other important facts on this earth-mover are also given. Broadside TD-119 lists the features of size, power and speed available in the B Tournadozer; basic specifications; and advantages to be gained by matching this production tool with the B Tournapull.

MODEL PE 20

H&B All-Electric Hot Mix Plant



Completely Wired — Completely Portable

MOTO-PAVER

The complete mixing and paving machine for mixed-in-place work. Write for Bulletin MP-47.

Hetherington & Berner Model PE hot mix plants are electrically driven. All motors and controls are furnished and installed, and completely wired at the factory before shipment.

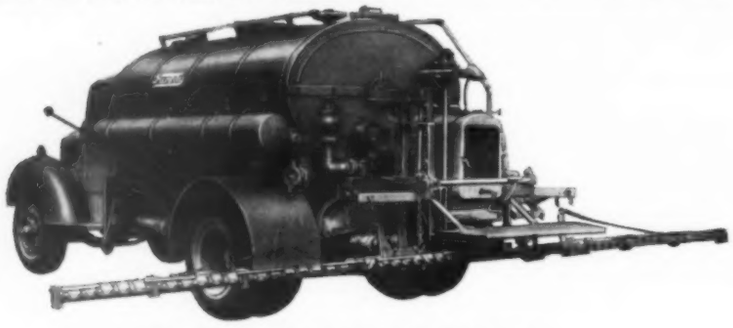
PE plants can be furnished with steam dispersion equipment, fugitive dust collection equipment, low pressure oil burners and dust handling equipment. They are completely portable, but retain all the features of a stationary plant that make for efficient and dependable production. Write for Bulletin P-46.

HETHERINGTON & BERNER INC.

721 Kentucky Avenue, Indianapolis 7, Indiana

H&B Builds Portable and Stationary Asphalt Plants of All Types, Sizes and Capacities

KINNEY BITUMINOUS DISTRIBUTORS



FOR BUILDING NEW ROADS
FOR MAKING OLD ROADS LIKE NEW

For almost forty years Kinney has produced Bituminous Distributors for modern road construction. Today, Kinney Distributors, with their famous positive displacement Rotating Plunger Pumps, are the recognized standard for applying all grades of bitumen in building roads, highways, and airports. Engineers know they can rely on Kinney Distributors to apply a uniform amount of bitumen across the full width of the road — as *accurately as a meter*. Operators find these units easy to manage. Convenient controls provide for exact matching of strips, quick starting and stopping, plus thorough cleaning and flushing of lines and spray bars.

Investigate the advantages of Kinney Distributors for modernizing old roads or for building new roads. Write for the new Bulletin A-48.

KINNEY MANUFACTURING COMPANY
3537 WASHINGTON STREET, BOSTON 30, MASS.
New York • Chicago • Philadelphia • Los Angeles • San Francisco
We also manufacture Liquid Pumps, Vacuum Pumps and Clutches

THEY *Roll Along* on ROGERS TRAILERS *Everyday Everywhere*

MORE AND BIGGER LOADS

An impressive number of the biggest contractors TODAY repeatedly put their confidence in ROGERS TRAILERS long proven ability to "deliver the goods" and "stand the gaff" over long periods of heavy usage.

Smaller operators, too, find in the extensive ROGERS LINE, the answer to their particular trailer requirements with proper capacity, road clearance, type of construction and strength with lightness.

We solicit inquiries which make your trailer problems our problems and we generally come up with the correct answer.

ROGERS HEAVY DUTY Gooseneck Trailers
ROGERS BROTHERS CORPORATION
DESIGNERS and BUILDERS of HEAVY DUTY TRAILERS
SINCE 1915
110 Orchard St., Albion, Penna.

26

Rock Salt Storage

A pamphlet, "How to Provide Low Cost Rock Salt Storage," prepared by International Salt Co., Inc., Scranton, Pa., contains engineering data and sketches for both indoor and outdoor storage. The pamphlet covers such factors as the amount of space required for storing various tonnages of either bulk or bag rock salt, piling arrangements, weight and volume of bulk rock salt and rock salt in 100 pound paper bags, and the slope required on chutes for loading and unloading rock salt. In addition to covering such factors thoroughly, the booklet states that International Salt Co. engineers will assist street and highway commissioners in solving special storage problems that may arise.

27

Macadam Base Construction

A new booklet, "Macadam Base Construction Methods," issued by Seaman Motors, Inc., 305 N. 25th St., Milwaukee, Wis., contains more than 16 pages of well illustrated text that explains the action of the Seaman Pulvi-Mixer and shows how the difficulties of even distribution and leveling of crushed stone and other aggregates can be overcome. Specifications applying the Seaman method are included.

28

Bucket Loader Performance

The Pettibone Mulliken Corporation, 4700 W. Division St., Chicago 51, Ill., has issued a new 12-page circular on the Haiss heavy-duty bucket loaders equipped with integral swivel belt conveyor discharge. This circular, besides giving the principal specifications of the various models of the Haiss bucket loaders, describes and illustrates with large pictures the advantages of the various applications of this type of materials loading.

29

Explosives Products

A new 64-page booklet, "Explosives Products," has been issued by the explosives division of Olin Industries, Inc., East Alton, Ill. In addition to a complete catalog of the company's explosives and their specifications and qualities, and recommended use, the booklet also contains such useful information for users of explosives as wire resistance and distance tables, comparisons of weight strength and density, burden on bore holes, suggestions for using electric blasting caps, sample calculations for field use and a list of 63 safety and handling "Don'ts."

30

Wire Rope

A new Wickwire rope catalog issued by Colorado Fuel & Iron Corp., Wickwire Spencer Steel Division, 500 Fifth Ave., New York, N. Y., offers a different ap-

proach to a difficult subject. New charts, tables, drawings and photographs were included to present a fresh slant on wire rope. The text has been written so it is pleasing to the technical man and is still understandable to the layman. This new catalog has three indexes that permit quick reference to the contents. The first section covers the characteristics of wire rope. The second section has been divided into six parts, describing wire rope for specific industries. The third section deals with the highly important subject, the care and handling of wire rope.

31
Snow Bucket and Snow Plow

Descriptive literature on a new 2-cu.-yd. snow bucket and 2000-lb. heavy duty V-type snow plow has been released by the Tractomotive Corporation, Deerfield, Ill. The leaflet includes overall specifications on both units which complete the list of Tracto-Shovel accessories designed for all-year-around adaptability to the Allis-Chalmers HD-5G tractor. Featured in the new literature are detailed instructions on rigid, efficient mounting on both units on the Tracto-Shovel assembly of the HD-5G tractor.

32
Contractors' Pumps

A 16-page bulletin issued by The Gorman-Rupp Co., Mansfield, O., covering a full line of self-priming centrifugal contractors' pumps, describes the new Gorman-Rupp self-priming feature. This priming action is fully explained and illustrated by "X-Ray" pictures showing what goes on inside the pump. Photographs are shown of the complete line of contractors' pumps ranging from the 7M, 2 in., to the 125M, 8 in. With each illustration is a description of the pump, its specifications and rating, for easy reference. The last pages of the bulletin are devoted to a section covering information on how to select the correct size self-priming centrifugal pump and valuable engineering data to assist contractors in solving their problems. There are also handy tables to assist in figuring pumping requirements.

33
Crawler Tractors

In a series of colorful new mailing folders, the Industrial Power Division of International Harvester Co., Chicago, Ill., presents design and performance details on four International diesel crawler tractors. The folders describe the International TD-18 of 80.5 drawbar horsepower, the 57-horsepower TD-14, and the TD-9 and TD-6 models of 39 and 29.5 drawbar horsepower, respectively. Profitable work applications of each are spotlighted in job shot illustrations. Sectional views of the tractors reveal engineering construction details developed to increase operational economy and efficiency. Exclusive International design features of the Diesel engines are also described and shown. Complete specifications of each tractor are given.

Sauerman Slackline Cableway digs gravel from lake and delivers 75 cu. yd. an hour to plant at cost of few cents a yard.

Sauerman Tautline Cableway of simple type is a profitable tool for handling materials on bridge construction and similar jobs.

Handle Material Faster, Cheaper

with a

SAUERMAN MACHINE

SPEED is the great need of these busy times and that is what you are assured at minimum expense when you use a Sauerman Cableway or Scraper machine for your dig-and-haul jobs.

A Sauerman machine can be installed to reach across a pit, pond, river or stockpile or up to the top of a hill and will move material at high speed from one point to another anywhere within its wide radius of operation.

Sauerman machines are backed by 40 years of specialized experience in designing this type of equipment. Whether it is an installation to handle a hundred tons or many thousand tons per day, it will be efficient and economical and easily operated by one man.

WRITE FOR CATALOG

SAUERMAN BROS., INC.

588 S. Clinton St., Chicago 7, Ill.

WISCONSIN HEAVY-DUTY *Air-Cooled* ENGINES

Four of a kind — winning power to spare in this hand! The same winning power you draw when you specify Wisconsin Air-Cooled Engines for your equipment . . . compact, heavy-duty singles in two types ranging from 2 to 9 hp.; twin-cylinder models from 7 to 13 hp., and V-type 4-cylinder engines from 15 to 30 hp.

All models are designed for heavy-duty service — delivering "Most Hp. Hours" of on-the-job service.

All models are extremely compact . . . to fit the machine as well as the job.

All models are built to one standard of top-quality excellence in design, materials and precision construction.

For "Winning Power", specify Wisconsin Air-Cooled Engines. Engineering data gladly supplied.

WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 14, WISCONSIN

34
Snow Loaders

Two snow loaders, a utility model and a heavy duty model, featuring spiral feed with renewable steel teeth and with capacities from 8 to 20 cu. yds. a minute, are described and illustrated in a new bulletin released by N. P. Nelson Iron Works, Inc., Clifton, N.J.

WITH THE MANUFACTURERS & DISTRIBUTORS

Osgood Appointment

J. M. Herring

James M. Herring has been appointed service manager for The Osgood Co., Marion, O. Mr. Herring has been with Osgood since 1928. He has served as motor mechanic, electrician and assemblyman, and in 1937 he became an operator-erector. He is well known to most Osgood distributors and owners due to his activities in the field in this capacity.

New LeTourneau Distributor

Miller, Bradford & Risberg Co., Inc., distributors of heavy construction equipment at 203 N. Dewey St., Eau Claire, Wis., have been appointed distributors for R. G. LeTourneau, Inc., Peoria, Ill. Their territory for marketing the LeTourneau line of heavy earthmoving equipment includes the state of Wisconsin with the exception of 11 northwestern counties.

Appointed Division Sales Manager

F. L. Johnson

Frank L. Johnson has been appointed division sales manager for The Osgood Co., and The General Excavator Co., Marion, O. His division will include the entire states of Washington, Oregon, California, Nevada, and parts of Montana and Idaho. He will make his headquarters in San Francisco. Mr. Johnson is a graduate of the Colorado School of Mines, with a degree of Engineer of Metallurgy. He was employed on several large engineering projects, one of which was Canol, the Canadian Oil Line project in Canada. Prior to joining Osgood and General's sales force in August, 1948, he was employed as sales engineer with the American Wheelabrator and Equipment Corporation of Mishawauka, Ind. Mr. Johnson underwent extensive training in the shops of Osgood and General Excavator before his assignment as division sales manager.

3 M Appointments

Robert N. Wolfe, currently manager of the Hutchinson, Minn., branch plant, has been appointed manager of operations at the new plant of the Minnesota Mining & Manufacturing Co., St. Paul, Minn., in Bristol, Pa. His successor at Hutchinson is William A. Aitken, now personnel manager for the company's main plant in St. Paul. The Bristol operations involve several 3M products, and the plant is designed to eventually service the eastern United States on these products. The Bristol plant was purchased from the War Assets Administration early this year and is now being converted for production. No date for the opening has been set.

R. N. Wolfe

W. A. Aitkin

BREAK PAVEMENT
the low cost way!

with the
MIGHTY MIDGET

The City of Compton, California, realizes the economy of using the MIGHTY MIDGET. Illustrated is the MIDGET breaking a 36" width of 7" concrete for a 14-mile water main. The MIDGET is driven by a 105 CFM compressor.

Find out what the MIDGET can do for you . . . ask your nearest dealer or write:

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ICE & SNOW CONTROL

CHEMICAL SPREADER

Clear chemicals are *cheap* and *effective* when applied with a "Scotchman." Used on dump trucks or pickups. Removable in three minutes. Bagged or bulk materials. Filtered air cools enclosed engine. Pushbutton starting and lights. Accurate control of application rates saves material. Instant control of width and direction of spread. Self-leveling. Stainless steel.

TARRANT MFG. CO.
SARATOGA SPA, N.Y.

Shunk Snow Plow and Ice Removal BLADES

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.

FOR ALL TYPES AND MODELS OF SNOW PLOWS
Various widths, lengths, thicknesses--flat or curved--standard or special--punched ready to fit your machine.

SHUNK SAW-TOOTH ICE BLADE
Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.

Shunk
MANUFACTURING COMPANY
ESTABLISHED 1854
BUCYRUS, OHIO.

EIGHT Reasons Why - - -
The La Crosse Wide Base Rim is the leader
More tread life . . . . reduced temperature . . . . fewer bead failures . . . less blow out hazard . . . . less sway . . . . compact tread . . . . lower tension . . . . economical operation.
HEAVY DUTY
LA CROSSE
TRAILER CORPORATION
LA CROSSE, WISCONSIN
Dealers in 48 states

Appoints New Representatives

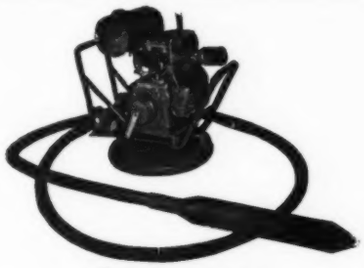
For new sales representatives for Penn Drake Gumont have been appointed by Pennsylvania Refining Co., Cleveland, O. The Glen T. Lees Associates, Minneapolis, Minn., will cover territory consisting of North Dakota, South Dakota, Minnesota and Northwestern Wisconsin. A. C. Doherty & Co., Boston, Mass., will serve the states of Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island. Hattendorf Sales Co., at Atchison, Kans., will represent Pennsylvania Refining Co. with Penn Drake Gumont in Missouri, Kansas, Iowa and Nebraska. General Sales Associates, Nashville, Tenn., will take charge of sales in Tennessee, Alabama and Mississippi.

Mack Shifts Key Men

Promotion of T. J. Zeller to factory manager of its Allentown (Pa.) plant, succeeding C. J. Moran, and advancement of A. C. Schliewen to manager of its Plainfield (N. J.) plant, succeeding Mr. Zeller, has been announced by Mack Trucks, Inc., New York, N. Y. In replacing Mr. Moran, who has been transferred to Mack's western sales headquarters in Los Angeles, Mr. Zeller assumes direction of the company's largest plant, in which all Mack trucks and buses are assembled. Mr. Schliewen's promotion to factory manager of Mack's Plainfield plant places him in charge of the production of all the company's gasoline and diesel engines.

Athey Appointments

Appointments of G. O. Britton as domestic sales manager and E. B. Schlenk as district representative have been announced by B. F. Lease, President of Athey Products Corporation, Chicago, Ill. Gerry Britton became associated with Athey last May in the capacity of assistant domestic sales manager. He has had many years of experience in the farm implement industry, having been sales manager of Kaiser-Frazer Farm Implement Division before joining Athey. Barry Schlenk will take over Athey's Central Territory contacting Athey-"Caterpillar" distributors in that area. Prior to the war, Barry was in the industrial sales force of S. C. Johnson & Son, Inc.



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Write for Circular on types, sizes and Prices
ELKHART White Mfg. Co. INDIANA

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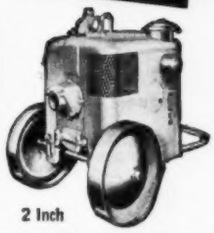
JAEGER "Sure Prime" is a better pump—*inside and out*

Contractors buy more Jaeger "Sure Primes" than any other pump because they're better engineered, more amply powered, conservatively rated, and fully enclosed from weather to keep them clean, dry, quick-starting and smooth running for extra thousands of hours . . . Sizes 1½ to 10". Ask for Catalog P-45.



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REGIONAL OFFICES: Philadelphia 7, 1504 Widener Bldg. · Chicago 1, 226 N. La Salle St. · Birmingham 1, 235 American Life Bldg.

COMPRESSORS · PUMPS · MIXERS · PAVING MACHINERY

NAILS NAILS AND MORE NAILS
MOST ALL SIZES ON HAND
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NOTE: WE WILL BUY YOUR SURPLUS NAILS

MOVE SNOW FASTER
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SNOW PLOW WAX
Brush or spray on mold-boards and wings.
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PORTABLE ASPHALT PLANTS
High Production—Low Cost
THE McCARTER IRON WORKS, INC.
NORRISTOWN, PENNA.

VULCAN PAVEMENT AND CLAY DIGGING TOOLS
ARE MADE in a complete line of sizes to fit all standard compressed air hammers.
Send for NEW Vulcan illustrated CATALOG today.
VULCAN TOOLS — THE WORLD OVER — NOTED FOR QUALITY AND DURABILITY
VULCAN TOOL MFG. CO.
QUINCY, MASS.

G. O. Britton

Barry Schlenk

During the war he served in the Army Air forces. After leaving the Army and prior to his connection with Athey, he was employed in the sales Division of Roy C. Whayne Supply Co., Inc., "Caterpillar" distributor in Louisville, Ky.

New Davey Dealers

H. B. Fuller Equipment Co., 8200 Jones Road, Cleveland, O., has been appointed to dealership by the Davey Compressor Co., Kent, O. The Fuller Co. will maintain complete parts and service facilities for Davey users in Northern Ohio. M. C. Burt Equipment Co., 2018 Clinton St., Rockford, Ill., has been appointed a dealer for Davey. The new dealer will serve that portion of the state immediately surrounding Rockford, bounded on the south by the counties of Rock Island, Henry, Bureau, LaSalle and Grundy.

Richards Promoted by LeTourneau

W. V. Richards

Wendell V. Richards, heretofore district sales representative for the New England states for R. G. LeTourneau, Inc., Peoria, Ill., has been appointed central sales manager, with headquarters at Peoria, Ill. As central sales manager he is supervising the activities of LeTourneau district representatives and assisting LeTourneau distributors in 20 midwestern states and 3 Canadian provinces. He succeeds W. B. Worden, who has resigned to return to the West Coast, where he has accepted a position with the Noble Co., Oakland, Cal. Mr. Richards has been associated with the LeTourneau Co. in sales department capacities since the plant located in Peoria in 1936.

Bergman Promoted by Joy

Joy Manufacturing Co., Pittsburgh, Penn., has announced the appointment of George W. Bergman as Knoxville district sales manager. Mr. Bergman was formerly assistant manager of the Knoxville territory.

Snow Promoted by Euclid

V. L. Snow, formerly manager of sales development, has been promoted to asst. sales manager of The Euclid Road Machinery Co., Cleveland, O. E. F. Armington is director of sales for Euclid and W. W. Paape is sales manager. Mr. Snow joined the Euclid Engineering dept. in 1935 and served as asst. chief engineer until 1942. Since that time he has been in charge of industrial products and the sales development department. R. M. Brown, also associated with Euclid since 1935, has succeeded Mr. Snow as manager of the sales development dept. He has been a member of that department recently but previously served in various purchasing and production capacities.

Hiller Promoted by Gar Wood

R. D. Hiller, Jr.

R. D. Hiller, Jr., heretofore district manager in the southwest for Gar Wood Industries, Inc., has been promoted to south central regional manager, with headquarters at Tulsa, Okla. Mr. Hiller's region consists of Nebraska, Kansas, Missouri, Oklahoma, Arkansas, most of Texas, Louisiana, Mississippi, and parts of Tennessee, Kentucky and Illinois. As one of his earliest actions as Regional Manager, Mr. Hiller has announced the appointment of Mr. W. A. Williams as district manager to fill the vacancy created by his own promotion.

Caterpillar Appointments

Gerald W. Wilson and William F. Jordan have been appointed district representatives in the Eastern Sales Division of Caterpillar Tractor Co., Peoria, Ill. Mr. Wilson will represent the company in contacts with distributors in

W. F. Jordan

G. W. Wilson

northern Georgia, South Carolina and eastern Tennessee, while Mr. Jordan will contact dealers in northern Ohio, Michigon and West Virginia. Mr. Wilson replaces F. S. Foster, who was named assistant eastern sales manager recently. Mr. Jordan succeeds R. E. Jeffries, who recently joined Missouri Valley Machinery Co., Caterpillar distributor at Omaha.

Armco Appointments

Joe S. Thomas heretofore assistant director of purchases for Armco Steel Corporation, Middletown, O., has been appointed director of purchases, succeeding Newman Ebersole, who died in September. Charles Beck, formerly assistant general superintendent of the Middletown Division, has been appointed to the newly-established position of manager of raw materials supply.

FOR SALE

1—**Lorain 82 Combination Shovel-Crane-Dragline** Cat. D-13000 Engine. New. 2-C.Y. Shovel Front, 70′ Crane Boom w/Fairleads.
1—**Lima 603 Combination Shovel-Crane-Dragline** 60′ Crane Boom w/Fairleads. Rebuilt Shovel Front.
1—**Lorain 75-D Crane-Dragline,** Cat. D-11000 Engine, 50′ Boom w/Fairleads, Long Crawlers.
1—**Lorain 78 Crane-Dragline,** Cat. D-13000 Engine, 50′ Boom w/Fairleads.
1—**Bucyrus-Erie 37B Combination Shovel-Crane-Dragline,** Cat. D-13000 Engine, 60′ Crane Boom w/Fairleads, Std. Shovel Front.
1—**Lorain 80 Hi-Lift Shovel,** Cat. D-13000 Engine, 30′ Boom, 24′ Stick.
1—**Marion 362 Combination Shovel-Crane-Dragline** Cat. Engine.
1—Link Belt K-375 Dragline-Diesel.
1—Lima 34 Paymaster Crane-Diesel.
1—Lorain 75-B Dragline-Diesel.
1—Lorain 75-A Dragline-Gas.
1—P&H 855 Shovel-Diesel.
1—Koehring 701 Dragline-Diesel.
2—Lima 101 Cranes.
1—Northwest 80-D Dragline.
1—Northwest 104 Dragline.
5—Caterpillar D-8 Tractors w/Dozers.
3—Caterpillars D-7 Tractors w/Dozers.
1—Athey Quarry 16-Yd. Trailer.
1—Schramm 210 Air Compressor.
2—G. M. 2-71 Diesel Power Units.
1—Waukesha-Hesselman 6-WAKH Engine.
1—Waukesha Gas Engine.
2—Ready Power 10-KW-250 V.D.C. Generators.
3—Kohler Light Plants.
7—Barnes 2″ Centrifugal Pumps.
6—Dempster Dumpster Units, 1½, 2, 3-C.Y. Yaun, Erie & Williams Dragline Buckets. Amsco Shovel Dipers.

HECKETT ENGINEERING, INC.

120 WEST PEARL STREET

BUTLER, PENNSYLVANIA

Phone 3775

FOR SALE

Motor Generator Sets

1—1000 KW GE Synchronous—250 volts—motor 1600 KVA Type TS Form AL—2300 volts 3 phase-60 cycle.

1—500 KW GE—Type MCF—Form H 900 RPM, 275 volts direct connected to 700 HP—700 KVA GE type ATI—60s cycles AC and DC panels.

In Excellent Condition

FRANK M. JUDGE & CO., INC.
7010 Empire State Building
NEW YORK CITY

FOR SALE

1947 Lima paymaster crane $11,000.00
1—D8 "Caterpillar" tractor and bulldozer
2—"Caterpillar" No. 12 motor graders
3—Super C Tournapulls
1—D8 "Caterpillar" almost new with new Le Tourneau (EP) scraper

LEWIS SHAW
DECATUR, ILL. Phones: 26213 or 27172

FOR SALE

1—D8 "CATERPILLAR" Diesel tractor with lights & PCU

2—15 yd. F.& F.P. LeTOURNEAU scrapers

1—34-15 "CATERPILLAR" Diesel generating set, portable

1—LU LeTOURNEAU 15 yd. scraper

✦

Above equipment in first class condition and available IMMEDIATELY. This equipment is located in southern Illinois.

L. W. RILEY
Box 397 Phone: 129 or 276
HARRISBURG, ILLINOIS

FOR SALE

1 Pioneer Grizzley Feeder, 40″ x 14′
1 Sheepsfoot Roller, Serial No. 11389, Model 4062, Engine No. Stearns-35008
1 Barber-Greene Paver, Serial No. 7-19, Model 879, Engine No. LeRoi-D-201
1 Sullivan Air Compressor, WN 102, 445 CFM, directly connected to Caterpillar D-13000 engine. Skid mounted
1 H-36 Westinghouse Electric Tempering Furnace box type, complete w/charging baskets, controls and switches
1 Asphalt Distributor, 850 gallon, drawn by 1940 Ford Truck
1 Water Pump 4″, centrifugal, Continental motor

RALPH ROGERS & COMPANY, INC.
720 ARGYLE AVENUE
NASHVILLE 4, TENNESSEE

DAM BUILDERS ATTENTION

Fall River Dam at Fall River, Kansas in Final Stages of Completion

All Equipment Available For Sale and Early Delivery. Inspect Now While in Operation

Johnson Concrete Plant—New 1947, capacity 120 yds. per hour—2-4 yd. Koehring Tilting Mixer—Consistency meter—Air entraining equipment—Ice Batching—3000 Bbl. cement silo.

Cableway—1500′ span—travelling head tower, stationary tail tower—Electrically operated.

Air Compressors—Electric Pumps—Transformers—Motors—Transmission lines—Capacitors—Miscellaneous Electrical Equipment—Lights—Buildings—Quonset, 40′ and 20′ widths—Complete Camp Equipment—Infirmary—Ambulance—Trucks—Pick ups—etc.

ARCOLE MIDWEST CORPORATION

3225 Main Street
Evanston, Illinois

Box 270
Fall River, Kansas

2—2′ Symons Cone Crusher.
No. 4-5 and 6 Austin Gry. Crusher.
No. 6 Gates Gry., Straight Discharge.
7½ Gates Gry. 7½ McCulley Gry.
16″ x 16″ New Holland Roll.
Pioneer 9x36 Jaw, roller brgs.
Iowa 9x36 Jaw. 30″x18″ Blake A.C. Jaw.
No. 5 Kennedy Van Saun.
No. 0 and No. 1 Raymond Pulverizer.
Webster Bucket Elevator, 45′, 19″ wide.
50 H.P. Muncie Oil Engine.
16½ ton Howe Truck Scale 18′.
¾ yd. Electric Shovel.
21 Marion Steam Shovel 1 yd.
3 Elevators, steel enclosed.
7½ ton 36″ ga. Mid-West Gas Loco.
32 Marion Electric Shovel.
9x8 Ingersoll Rand Compressor.
3 Dempster Hoists. 12 Steel Boxes.
Cletrac Angledozer, 8′ blade, rebuilt.
Clarkat Heavy Tow Motor.
48″ Scott Mine Fan.
12½ ton Whitcomb gas Loco., 56½″.
Model 6 Northwest diesel Crawler Crane also shovel front.
48″x8′4″ N.B. boiler, 160 lbs.

McCartney Machinery Co.
Youngstown, Ohio

FOR SALE

HOISTS

American 70 ton Stiff-Leg 110 ft. Boom, 75 ft. Mast. New Condition.

Lidgerwood—12 x 12—Skel. Steam Hoist—3 Drum with Swinger—Air Controls. 35000# S.L.P.

LOCOMOTIVES

VULCAN 35 Ton 0-4-0-Cat. D-17000 Mechanical STD-GA.

BALDWIN 50 Ton Saddle Tank—36" Gauge—Code Boiler.

DAVENPORT 45 ton Diesel Electric Number 2377—like new.

Vulcan 66 ton Saddle Tank—Code Boiler St. Ga.

1—P & H 255-A New Trench Hoe Attachments.

49—Western 20 Yd. Air Dump Cars.

3—C.M.C. 10" S.P. Cent. Pumps—Gas. Like new.

Lambert 20 Ton Steel Stiff-Leg Derrick—86' boom Bucket operating.

32—Western 5 Yd. 36" Ga. Dump Cars.

Huber 8-12 Ton Diesel Tandem Roller—1943.

T.C. 9 Diesel Crane—1944.

Write R. H. BOYER, Mgr. Equip. Division

CHARLES DREIFUS CO.
14 S. 12th, Phila. 7, Pa.
Write, Wire or Phone — Phone Bell-Walnut 5050

FOR SALE

4'x16' Open end tube mills (3)

Air compressors

All steel dredge boats, scows, tug boats and pug boats

Chicago Pneumatic Simplex vacuum pump with receiving tanks and valves

Steel Bins and hoppers

Fuller-Kinyon pumps 5" and 6"

Dry pan mill

Belgian flint grinding pebbles (11 tons)

6'x50' Manitowac Dryer (1)

Richardson automatic scale

B & W Foster-Wheeler express type boilers generating at 100%, 122,-500 lbs. steam pressure per hour

1 Yd. and 1¼ Yd. Clam-shell buckets

4 Wood hoppers lined with steel

OLLIE E. LAWRENCE
BOX 688
QUINCY, MICHIGAN

FOR SALE

9 Jaeger 3-Cu. Yd. mixers, mounted on 1 White, 2 International, 6 Mack trucks.

All mixers and trucks 1941 models.

All are working now.

Price: From $1500 to $3000 each.

THE GOFF-KIRBY COMPANY
1940 E. 6th St., Cleveland 14, O.

REBUILT CRUSHERS

1—No. 6 Champion, Jaw, 12"x26" opening.
1—No. 4½ Champion (No. 10 Beaumont) Jaw, 10"x 20" opening.
2—No. 4 Champion, Jaw, 9"x15" opening.
2—No. 6 Traylor, Gyratory, with T.Z. head.
1—No. 4½ Traylor, Gyratory.
1—Penna. Single Roll Crusher 18"x24".
1—Double Roll Crusher 16"x24".
1—Jeffrey Swing Hammer Mill, Type A, 24"x18".
1—Jeffrey Swing Hammer Mill, Type A, 30"x24".
1—18"x36" Farrel—Type "B"—Not Rebuilt.
1—18" LINK-BELT APRON CONVEYOR—9" pitch, 27' centers, like new.

JOHNSON & HOEHLER, Inc.
P.O. Box 102
Lansdowne, Pa.

FOR SALE

34E Foote Paver, Serial #49042

Blaw-Knox Gas Electric Finisher 18 to 22'. Bargain

Jaeger Finsher-Spreader, Ser. #130

Collignon Construction Co., Davenport, Iowa
910 Kahl Bldg.

FOR SALE OR TRADE

New Sullivan 22-HD core drill and FM 3x4 duplex pump, mounted on trailer, 30" hydraulic chuck, hydraulic operated mast, barrels bits and rod for B and N drilling. A complete unit, inventory over $11,000.00. Will sell for 70% of inventory or trade for Bucyrus-Erie 24-L churn drill or 22-W churn drill and cash.

J. D. JUDD & SON
Shullsburg, Wisconsin

FOR SALE

1¾ yd. Lima 701 crane-shovel-dragline. Superior diesel, overhauled. 60 ft. bm. Bargain.

1½ yd. Lima 601 Crane-shovel-dragline. Caterpillar D-13000 engine. 70 ft. bm. Excellent shape.

25 ton Wiley steel stiffleg derrick. 60 ft. bm., 30 ft. mast. Condition new.

STEEL SHEET
PILING & PILE HAMMERS
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515 Locust St. — St. Louis 1, Mo.

Quick Delivery

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GALVANIZED STEEL SHEETS

GAUGE 14-30

CONTINEX, INC.
50 Church St., N. Y., N. Y.
DI 9-1460, Ext. 10

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Good used equipment
Belonging to our customers

Air Compressors

500 cu. ft. Ingersoll-Rand with Hesselman diesel engine.

315 cu. ft. Schramm, with International UD18 diesel engine.

210 cu. ft. Chicago Pneumatic diesel with Cat D8800 power unit.

Crushers

Cedar Rapids 20 x 36 roller bearing jaw, rebuilt and guaranteed.

Cedar Rapids 10 x 36 roller bearing jaw.

Cedar Rapids 30 x 18 roll crusher in A-1 condition.

Day portable 10 x 20 crusher with elevator and screen.

OSBORNE EQUIPMENT COMPANY
Knoxville — Chattanooga

Equipment Available Immediately

1—K-14 Insley, ⅝ yd. Crane clamshell and dragline, 40' boom. Chrysler gas engine, 24" treads. Almost new $11,500
1—Barber-Greene Model 44B Ditcher 18" x 24" wide x 8' 3" deep, powered by Buda ETU gas engine. Just rebuilt $6500.00
1—Ross Model 19HT Lift Truck, 7,500# capacity, 18" x 52" adj. carriage, 48" forks, excellent condition. Price $4500.00
1—Lima Model 101; 1¼ yd. shovel. Gas engine. Good condition. Price $10,500

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Richmond & McLean Sts., Cincinnati, O.
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AC-HD10W W / Gar Wood Dozer. Fair Condition.....	$ 5,500.00
AC-HD14C W / Gar Wood Dozer and Carco Winch. Good..	14,000.00
RD-7 W / LaPlante Choate Dozer and Double Drum. Control Unit. Good Condition.....	6,500.00
RD-50 W / LeTourneau Cable Dozer and Double Drum Control Unit. Fair Condition....	4,500.00
AC-HD7W W/ Gar Wood Dozer. Good Condition.....	6,000.00

ED MEYER TRACTOR CO.
MT. VERNON, ILL.
PHONES: 2881 Or 3150

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USED EQUIPMENT IN STOCK

1—HD-14 tractor, 1942, with dozer, Double drum winch. Excellent condition.
1—New Stackline cableway excavator including Sauerman ½-cu. yd. bucket, carriage, American 2 drum hoist with Chrysler power unit, 62' steel mast, and all necessary cable and fittings.
1—Rex 2-yd Hi-boy truck mixer.
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1—½ yd. General Trenchoe excavator.
1—11 ft. Highway lime spreader.
1—9 ft. Highway lime spreader.
1—4-5-yd. St. Paul dump body with 7" hoist.

RUFFRIDGE JOHNSON EQUIP. CO., INC.
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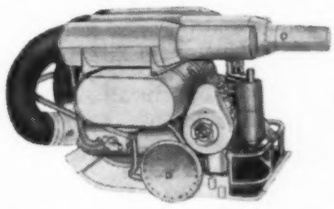
PORTABLE HEATER SALE

IMMEDIATE DELIVERY



Stewart-Warner portable powerful 100,000 BTU gasoline-burning heaters complete with turbine type blower and 1½ HP. air-cooled ball-bearing engine.

PORTABLE SELF-POWERED MANY PURPOSE HEATER.

HEATING buildings, shops, sheds, warehouses, manholes, tunnels, buildings under construction, spot-heating, etc.

PREHEATING engines, tractors, trucks, equipment, etc.

THAWING frozen areas, machinery, pipe lines, tanks, etc.

DRYING plaster, paint, mortar, concrete, etc.

ORIGINAL COST.....$583.00

SALE PRICE . . $195.00

Complete with flexible ducts

Send for literature

BERNSTEIN BROTHERS

Since 1890

Dept. R.R. PUEBLO, COLORADO

FOR SALE

1—Huber maintainer, run 50 hours. Price $2,400.00

1—"Quick-Way" Model E, mounted on Biedermann truck with shovel front and crane boom $5,900.00

WALT KUNZ

R.R. 13, Mt. Washington Cincinnati 30, O.
Phone: Sutton 6336-J3

AIR COMPRESSOR: 60 to 500 cu. ft. Portable.

BUCKET: ¾ yd. Yaun. Dragline, Basket type.

CONVEYORS: 1—24" Belt, 24 ft. long; 1—New 8" belt, 13 ft. long.

CRANES: 1—Loraine ¾ yd. 40 ft. boom with Backhoe; 1—Insley ⅝ yd. mounted on Corbett 7½ ton truck; 1—Link-Belt Speeder, model YC9.

CRUSHER: 1—Universal 10"x30" with power unit.

BITUMINOUS SUPPLY TANK: 1—New Rosco 800 gal. capacity.

ENGINES & POWER UNITS: New and Used various sizes.

FORMGRADER: 1—Cleveland, Model HAK-42A.

GENERATORS: 3—new Onan 12.5 KVA. 1—Westinghouse 125 KVA. 1—50 KVA Powered by 2 LeRoi heavy duty natural gas engines.

KETTLE: Tar—1—New 165 gal. Portable. Mfg. by White.

MIXERS: 1—108 Ransome, pneumatic tires; 1—7S CMC four steel wheels. 1—new ½ bag, pneumatic tires. 2—new Essick, 1 bag mortar. 1—Used, 1 bag Wonder mortar.

PUSHDOZERS: 2—30"x40" face for HD14 Tractor.

ROAD ROLLERS: 6—3 to 12 ton, three wheel and tandem. Diesel & Gas.

SCRAPERS: 1—LeTourneau, Model FP 14 yd. truck. 1—new Henry 3 yd. capacity. 3—new LaPlant-Choate, 1½ yd.

SHOVEL: 1—"Quick-Way", 4/10 yd. mounted on 5 ton Coleman Truck.

TRAILERS: 1—Fruehauf Lowboy 60 ton. 1—Fruehauf Semi 8 ton. 1—New Standard Semi 10 ton.

TRUCKS: 1—Studebaker 2½ ton, 6x6. 1—Chevrolet, 1½ ton, 4x4.

WINCHES: 1—Hyster, single drum for D8 Tractor. 1—Hyster, double drum for D4 tractor. 1—International TD18 for TD18 tractor, front mounted.

Falls City Sales Company

1212 Wilson St. Louisville 10, Kentucky
P. O. Box 776

FOR SALE

1946 Model 1020 ¾-yard unit shovel and dragline combination. Used 6 months, $9,500.

2—TD9 International tractors equipped with Bucyrus-Erie front end loaders and dozers. 1947 models.

1—TD9 International tractor equipped with Bucyrus-Erie angle dozer. 1946 model.

1—RD7 Caterpillar with Le Tourneau angle dozer. A-1 condition.

1—1943 Junior Mack truck with 3-yard dump box.

2—New Lessmann tractor power shovels, ¾ and ½ yard. Will sell at factory cost.

Gar Wood truck winch 30,000 pounds.

2—300 amp Lincoln gas driven welding machines with cables.

1—Sullivan air compressor, 105 ft. 4-cyl. gas driven.

All above equip. have had new rings and valve job and are mounted on rubber tires.

TRI-STATE EQUIPMENT CO. INC.

541 Lumber Exchange Bldg., Minneapolis
Phone Main 3643

FOR SALE

ONE REX MODEL 160 PUMPCRETE

Rubber-tired wheels, remixer, auxiliary equipment, including 350 ft. 6" pipe with fittings.

Excellent condition. Just overhauled. Priced right for immediate disposition.

WILTSCHECK & NELSON, INC.

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Telephone: Prospect 6252

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TARPAULINS

New waterproof 12-oz. material and grommets

12x16	$14.75
15x20	22.50
18x20	32.40
20x20	30.00

Immediate delivery.

L. K. LIPPERT EQUIP. CO.

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Phone: Adams 8839

FOR SALE

1—150 ton ph, Cedarapids washing plant—complete with 220 volts, 3 Ph electric drive motors. Including 18"x80', 18"x197', 18"x340' triple deck conveyor. Also 24"x90' feed conveyor with 10 yd. feed hopper.

4—60 ton Butler bins complete with scales.

1—100 ton, 3 compt. Butler bin.

1—24"x50' conveyor.

1—3'x8' double deck screen.

1—4'x14' triple deck screen.

1—40 HP 220, 3 PH 900 rpm electric motor with starting switch.

1—LeRoi, RA-4, 95 HP gas engine unit (clutch and outboard bearing).

1—8" Superior McCully crusher.

GURZICK SUPPLY CO.

Sault Ste. Marie, Michigan

Phone 1674

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A complete line of engineering Instruments and Equipment for Field or Office. Write for Bulletin RS-28.

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Originally cost gov't $7,000. Now priced at such a very small fraction of that figure. With White 160AX motor, 4-speed trans. with auxiliary 2-speed shift and super power low speed drive. Hydraulic brakes, 900x20 tires. Excellent for logging, skidding, construction work, house moving, dump work. Available with or without winches. We carry a full line of replacement parts.

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2 International KS-7 Quarry Trucks (1946) with KS-8 Axles and Marion Quarry Bodies

One Northwest ¾ Yard Crane, Model No. 2 Serial No. 3742.

One Osgood 1½ Yard Victor Shovel, Serial No. 2864.

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FOR SALE

1—New No. 3 Smithmobile truck mixer.

1—Unit ¾ yd. combination shovel & backhoe, dragline & crane. Excellent condition.

1—K14 Insley dragline, wide tracks, 40' boom, ⅝ yd. bucket. Two years old.

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1—Schramm 105 portable compressor.

1—Gardner Denver 105 portable compressor.

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TRACTORS & ROAD EQUIPMENT

4—Caterpillar D8's cable operated bulldozer's 8R series
4—Caterpillar D7's (3 angle dozers, 1 bulldozer)
1—Caterpillar D2 Hydraulic angledozer
1—Caterpillar D4 Hydraulic bulldozer
1—International TD14 Hydraulic angledozer

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1—Galion 101-D Tandem with scarifiers
1—Rome UD 14 Diesel Tandem with scarifiers
1—Barber-Greene loader 3 Cu. Yd. per minute, 82A Model

ATTACHMENTS

6—Caterpillar and Le Tourneau Double Drum Power Control Units, to fit D7's, A-1 Condition.
2—La Plante Choate surplus bulldozer blades new, fit D7
3—D7N Hyster winches for D7, sold with machines

"We own and have in our yard the above reconditioned equipment."

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Approximately 7 Tons 1½" Round Hollow HBA—Swedish Drill Rods

Also 1" Hex Hollow and 1¼" Rd. Hollow and 1¼" Timken Hollow Round Rods—2' up to 40' Long

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Equipped with shovel & backhoe
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Equipped with Bucyrus-Erie angledozer
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Euclids end dump and bottom dump—KR11 Int. trucks—Tournawagons—Super C Tournapulls

Steam cranes std. ga. Gas or diesel Loco—24, 36, 42 in. ga. Elec. Loco—St. Ga. 20 Ton. Dump Cars 55 Cu. Ft., 130 Cu. Ft., 16 Cu. Ft. Ore Cars Std. Ga. 50 tons

Rotary Kilns—Rod Mills—16"-30" Gyratory Crushers—30x18, 40x22 Roll Crushers—40G Slugger Hammermill—9x36, 10x24, 10x36, 14x24, 18x36, 20x36, 24x36, 30x42, 40x42, 42x60 Jaw Crushers—some portable, some with feeders—Cone Crushers, 3 and 4 Ft.—Screens sgl. and double and triple dk. Feeders 3x10, 30x5—Door Classifiers—Cent. pumps—Deep well pumps—Tuggers—Mine hoists—75, 100, 150, 225 H. P.—Motors—Transformers—Conveyors—Portable Gravel Plants—Road Rollers—Wagon Drills—Bu.-Er. 29T & 42T Blast Hole Drills—Many other items

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1—TD18 tractor & bulldozer with LeTourneau 9 yd. scraper.

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One new Byers Model 83 combination clamshell & dragline

35' boom, extra-long crawlers, extra-wide shoes, powered by a Buda, 6 cyl., gasoline engine.

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1—Used D-8 Caterpillar Tractor—Serial No. 1H3247

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2—Used LP 12-Yd. LeTourneau Carryall Scrapers

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10,000 lin. ft. Blaw Knox Road Forms, unused, 8" x 8" with pins.

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New 105 Davy Portable Compressors.

New material-handling clam buckets in stock.

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FOR SALE

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2—D7 'Caterpillar' Tractors w/ LeTourneau Double Drum Power Control Units and Dozers and LeTourneau Model LP Carryall Scrapers. Tractors 3T Series.
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4—LeTourneau Super C Tournapulls w/ TLP Carryall Scrapers.
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1—D7 'Caterpillar' Tractor w/ LaPlant Choate Hydraulic Dozer and Hyster D7N Towing Winch. Good Condition.
1—Byers Model 83 Clamshell, Dragline, Crane and Backhoe Combination; powered w/ Caterpillar D-318 Engine. Good as New.
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NEW IMMEDIATE DELIVERY

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Oliver-Cletrac BDH W/Heil Dozer, Galion Motor Graders, 102 and 202 Models

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Oliver-Cletrac DDH, Rebuilt Guar.
Seaman pulvi-Mixer, Like New
Jaeger 10S Concrete Mixers
Two 3-Yard Smith Truck Mixers

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1—Northwest—1½-yd. Crane.
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1—Complete Agricultural Lime Pulverizing Plant consisting of the following: 30"x24" type A2 Jeffrey Pulverizer with V-belt drive and No. 3 Jeffrey Vibrating Feeder; 1—31'x8" No. 411 enclosed Bucket Elevator with Spiral Feeder and 3 HP Gearhead Electric Motor; 1—3'x6' model LS double deck Simplicity Gyrating Screen, right hand drive, ball tray lower deck, 2 HP Howell Electric Motor and extra screens; 1—75 HP. Electric Motor with starter and extra hammers, grate bars and misc. parts for Jeffrey Pulverizer. Electric Motors are 3 phase, 440 volts, 60 cycle, current. All of the above equipment was purchased new in 1940 except the Gyrating Screen which was purchased new in 1945.

1—Kennedy-Van Saun 11"x20" Jaw Crusher. New in 1939.

1—5'x14' model D Double Deck Simplicity Gyrating Screen with ball tray attachment, left hand V-belt drive, 15 HP, 1800 RPM, 440 volt, 3 phase, 60 cycle Fairbanks-Morse Motor, extra screen cloth and misc. parts. Purchased new in 1945.

1—4'x10' Seco type M Triple Deck Vibrating Screen with 7½ HP Electric Motor, 3 phase, 440 volts, 60 cycles. This screen in first class condition and was new in 1941. Extra Screen Cloth and misc. parts.

1—3' Symons Cone Crusher with 75 HP Electric Motor, V-belt drive, starter for motor. This crusher was purchased new in 1938 and in excellent condition.

1—17"x24" bucket elevator, 96 buckets, 2' spacing of buckets with 40 HP, 3 phase, 440 volts, 60 cycles electric motor with V-belt drive. First class condition.

1—10"x18" bucket elevator on belt, 100 buckets, 13" spacing, wood frame, 5 HP gearhead, electric motor with chain drive. Very good condition.

1—Model 400 Eagle truck mounted loader mounted on 1940 model heavy duty Chevrolet chassis with new motor this spring. Loader purchased new in Oct., 1948.

1—Model 42A Barber-Greene stock pile loader, serial No. 2249-42-5-63. Manufactured in 1932. This machine is in fair condition and ready to go to work.

1—Catalogue No. 794 fig. 240-6000 lb. Shaw electric hoist, hand geared trolley, 440 volts, 3 phase motor. New. Price $1,000.00.

1—Huber 3-4 ton Tandem roller. Slightly used.
1—Used 24"x16' sand drag, price $700.00.
1—Used 28"x16' sand drag, price $800.00.
1—Used 4'x6' revolving scrubber. Price $900.00.
1—½ yd. Bay City shovel. Price $3,000.00.
1—½ yd. Ohio shovel. Price $2,000.00.
1—Gledhill road scraper. New. Price, $500.00.

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1 Model RTX All-Purpose Spreader

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1—United dragline with Case tractor.
1—Overhead dragline with double winch and all cables complete.

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Ingersoll Rand Wagon Drill Type FM 2 on Pneumatic Tires. Price $600.00.

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NEW—TORNAPULL, Model Q, with bulldozer, with Model D scraper.

NEW—DRAGLINE and Clamshell buckets all popular makes, sizes from ½ cubic yard to 2½ cubic yards.

NEW—INTERNATIONAL K-11.

USED—D-8 Caterpillar Tractor, with Hyster Hoist, with Angledozer like new.

USED—HUBER, 10-ton roller, Caterpillar Diesel D-4400 engine driven three-wheel.

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Cartwright 20 foot distributor spray bars—serial D-857. Like new.

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Subject to Prior Sale

7	Caterpillar D-7 With Dozer and D.D.P.C.U.
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1	Caterpillar D-6 With Dozer
1	Caterpillar D-4 With Front End Winch
1	Caterpillar R-5 With Dozer
6	Caterpillar No. 12 Motor Patrols
1	Caterpillar No. 112 Motor Patrols
1	Caterpillar D-7 Hyster Hysterway Dragline with ½ yd. bucket
1	Caterpillar D-7 Hyster Winch
10	Scrapers
4	Super C Tourneapulls
7	Euclid Bottom Dumps
4	315 Air Compressors
3	Wagon Drills
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2	10 Flat Wheel Rollers
3	Pneumatic Rollers
10	Sets Sheepfoot Rollers
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Trucks, pick-ups, water tanks, welding units, etc.

Will sell in units or individual.

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Price complete.....$2,500.00

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1—7 ft. Hydraulic Dozer.
All in good condition.
Priced to sell.....$1,200.00

General Shovel Dragline, Drag Bucket, All Equipped. Good Condition $2,500.00

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66" Dia. x 50' 0" Long

Complete with all drives and burners. Good capacity. In excellent condition.

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Motorized Truck-Man For Sale

22 — 6" Channel Iron Frame, Gussetted, Castered Trucks. Some knocked down, some assembled. Also three brand new Truck-Man Motorized Hydraulic Lift-Trucks. Under-clearance suitable for above trucks.

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One new Cyclone Blast Hole Churn Drill mounted on full crawler, gasoline driven, with drill designed for 2000 lbs. of tools, recommended drilling range from 5⅝" to 6⅝" diameter holes. This drill is offered at a special price as an entirely new model drill now in production.

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Link Belt Model K-55 crane
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Int. UD-18 power unit

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Will sell individual units or as complete plant.

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Write for price and specifications

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Allis-Chalmers Model HD-10W Long track diesel tractor with Gar Wood cable tipdozer and double drum cable control unit. 1948 model like new.

P & H 1 cu. yd. Dragline model 455-A, 1947 Model, Serial #11044. This machine is equipped with Buda diesel engine and light plant. 50 foot boom and 1 yd. bucket. Like new.

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Starbuck, Minn.

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CRANE - CRAWLER with 35' boom — Serial 10146. 10-ton cap. at 12'. Good running condition. Waukesha gas power. Price $4000.00 f.o.b. our yard.

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Caterpillar D4 Bulldozer	3,250.00
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Adams 51 Diesel Motor Patrol	750.00
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Allis Chalmers W.K. with Winch	950.00

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Ph. Franklin 1750, 717 S. Vandeventer, St. Louis, Mo.

Cedar Rapids, Iowa, Junior Tandem Gravel Plant, Mounted on pneumatic tires with washing and screening plant. This plant will turn out 150 tons per hour. Less than two (2) years old and has been used only about three (3) months.
D-7 Caterpillar with hydraulic angle dozer.
TD-18 International with power control unit and cable blade.
Six (6) yard Le Tourneau scoop, 6 yds., Struck 8 yds., with all new rubber.
Lorain L-41 Crane with 75 feet of boom. This is a ¾ machine in excellent condition.
¾ yard Buckeye Crane with 35 feet of boom.
Caterpillar No. 10 Motor Grader in good condition, equipped with new rubber.
K-11 International Tractor and 35 Ton Rogers Trailer.
K-7 International 23 foot Trailmobile Flat Trailer.
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Three (3) Concrete (Jaeger) Mixers, all in good condition.
Portable conveyor mounted on pneumatic tires.
Two (2) ¾ Yard Drag Buckets. One (1) ¾ Yard Clam Bucket (Blaw-Knox).
This equipment is in good condition. We are discontinuing this line of operation.

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1—Adams Motor Grader—small, very good condition, hand operated	700.00
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1—Gardner-Denver 110' compressor, overhauled	1,250.00
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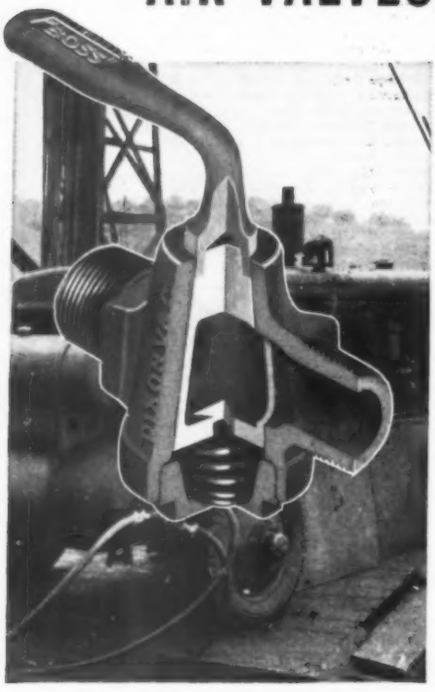

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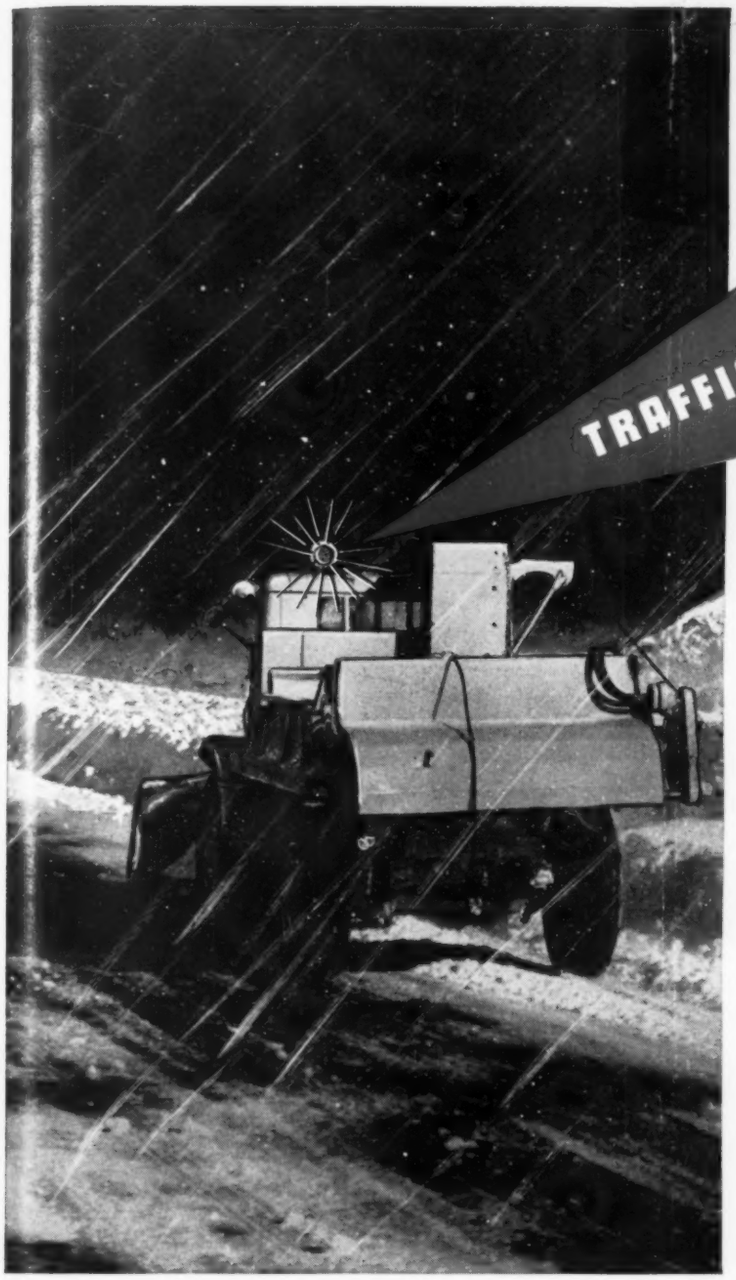

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